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Takharuj-Based Model to Optimize Productive Land Distribution

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Abstract

Most Muslims believe that *Faraid* is the ultimate rule to distribute inheritance. *Faraid* implementation may cause issues on land distribution. When a small piece of land is subdivided among the legal heirs, the portion of land received might be insufficient to even build a house. The awareness on *Takharuj* concept which is based on mutual consent in inheritance distribution may help solve this problem. The aim of this research is to optimize land distribution and land use. Specific assumptions were made to lineage, family ties and land criteria. This article reports the use of Goal Programming to formulate a *Takharuj*-based model that can solve issues regarding productivity of land that has been distributed using *Faraid* laws. Goals set for the programming were to minimize the deviations for the portion of land and to minimize the number of heirs who owns the piece of land after combination. A list of possible combinations of the arable land size was generated. The model was able to select the optimal combination based on the minimum weighted sum of deviations from the goals that were set. Therefore, this research has successfully provided a useful *Takharuj*-based model to optimize the arable land size where the land owned by each qualified heir can be categorized as a productive land to be developed.

Keywords: Combination; *Faraid*; Goal Programming; Optimization; *Takharuj*

Introduction

Every living person will die one day. In Islam, four compulsory aspects must be settled for a deceased Muslim (Yaakob, Fadzil, Shaban, & Rahman, 2017). These aspects are maintenance and burial costs, deceased's debt, wills of the deceased, and distribution of inheritance assets among heirs.

Allah has devised a way to divide the inheritance assets among heirs. He has specifically defined and emphasized Islamic inheritance laws (*Faraid*) in Al Qur'an 4: 11- 12 and Al Qur'an 4: 176 in Al Qur'an. However, Allah does not prohibit the Muslims from using other alternatives in estate distribution if all conditions are fulfilled as described in Al Qur'an 4:128,

> *"And if a woman fears from her husband contempt or desertion, there is no blame on them if they make terms of reconciliation between them – and reconciliation is best. And present in souls is stinginess. But if you do good*

and fear of Allah – then indeed Allah is aware of what you do, Acquainted."

All four *mazhabs* permit the use of *Takharuj* by relying on this verse. Thus, eligible heirs can reconcile terms of settlement between them. More importantly, these terms must be done in harmonic family discussions. However, settlement was not able to be achieved in situations where i) family fights over property to be distributed, ii) cases left unattended due to no unanimous decisions among family members, 3) mistaken belief that *Faraid* must be the ultimate rule to use for distributing estates, and many more (Sabtu & Mahamood, 2017).

Zulkifli, Batiha, and Qasim (2018) stated that the increment of unclaimed properties of the deceased Muslims in 4 years was RM20 billion. It can be reduced if Malaysians are aware of the existence of *Takharuj* system that allows all heirs to discuss on the estate distribution. The *Takharuj* concept concerns the consensus or consent of all beneficiaries in estate distribution, and it is not forbidden by Allah. It can be seen as an improvement done to suit the current life situation (Wan Mohamad Ali & Ahmad, 2013). Therefore, this concept is adopted in the current research as an enhancement to the current *Faraid* distribution system.

Motivation: *Takharuj* Concept to Enhance *Faraid* Implementation on Land Distribution

According to Awang (2008), land is necessary to be distributed wisely as it might cause problems in the future regarding administrative matters. For instance, difficulty in the process of changing names and tax property payment usually occur when there are a large number of beneficiaries of an estate. Furthermore, division of any small-sized land causes its value to be low and difficult to be commercialized.

Many Muslims have practiced using *Takharuj* in Malaysia. The heirs must agree to any development that will occur on an inherited land. Difficulty arises when the heirs in the same title did not unanimously vote. If all heirs mutually agree on the matter, *Takharuj* can tackle issues in estate distribution such as i) parents refuse to accept their entitled inheritance assets and they want their children or siblings to have them, ii) a family member is more in need than the others, and iii) some or all heirs disagree on suggested *Faraid* allocations. When these portions unite as one, productivity can be achieved (Wan Harun, 2011).

Takharuj resolves land distribution in three ways: i) use *Faraid* portions, ii) equal portions, and iii) mutual consent between heirs (Wan Harun, 2011). *Takharuj* allows the heirs to willingly waive the allotment and agree to terms that are more in line with the current state of the property and the heirs' need. This withdrawal can be settled with or without compensation. Thus, subdividing property into smaller lots with little value and benefit can be avoided (Rusnadewi Abdul Rashid & Ahmad, 2010; Rusnadewi Abdul Rashid & Yaakub, 2010).

The ideal situation now is to increase the number of arable and productive land in Malaysia. However, wasted land issues are increasingly detrimental to the heirs. The number of idle lands in Malaysia for year 2019 are 103,563 hectares involving 46,382 lots in Peninsular Malaysia including the Federal Territory of Labuan (Department of Agriculture, 2019).

The situation worsens when the current legal land provision allows registering many names on a deed to a small inherited land. Normally, *Faraid* implementation causes reduction in land size owned by each heir (Rusnadewi Abdul Rashid & Yaakub, 2010). This is a significant issue

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that needs to be addressed. Each land has its own price and it should be fully utilized whether for house building, plantations or else. The resultant small piece of land after settlement may be insufficient to even build a house. Consequently, the land i) is normally abandoned, ii) cannot be effectively managed, and iii) is not economically productive (Awang, 2008). There is a need to revise the current implementation of the *Faraid* system. Therefore, the current research wishes to highlight the importance of enhancing the current system by adopting the *Takharuj* concept.

***Faraid*: Modelling the Rules**

Faraid is an Al Quranic command, thus it is widely practiced in every Islamic country. However, there are many people who are not aware or ignorant of this concept. Therefore, it is crucial to learn the basic knowledge of *Faraid* as Muslims.

Faraid is called '*Ilmu Mawarith*" or the science of inheritance (Zuleika & Desinthya, 2014). It refers to the Islamic laws that concern the devotional acts that are primarily based on *Syariah* regarding someone's wealth after death (Zulkifli et al., 2018). Abdullah, Radzi, Johari, and Dastagir (2014) stated that *Faraid* law is one of the greatest contributions to the world's legal system. Hishamudin (2012) listed the major components of *Faraid* as the deceased (*Al-Muwarrith*), the heirs (*Al-Warith*) and the property left by the deceased (*Al-Mauruth*). Razimi and Shahril (2016) declared that *Faraid* properties can consist of land, building such as houses, jewelries, animal livestock, insurance and cash.

Faraid rules that govern property distribution are mentioned in the following verses:

> *"Allah tells you things that involve your children: for your son, is equal to the share of your two daughters. However, if there are only daughters, two or more, then two thirds of the deceased's estate will be inherited to them. And if there is only a daughter, then half is her portion. And if the deceased left any children, then for the deceased's father and mother, to each of them is a sixth of his estate. But if the deceased only had parents when he left, then one third is entitled for his mother. But if he also had any brother or sister, then for his mother is a sixth after all will and debts have been paid. Your parents or your children – you know not which of them are nearest to you in benefit. These portions are ruled by Allah Himself. Indeed, Allah is ever Knowing and Wise. And for you (husband), if there is no child left, then half of what your wives leave is yours. However, if there is any child, then one fourth is yours after all wills or debts are settled. And for wives, if you leave no child is one fourth but one eighth for your wives if you leave any child. And if only has a brother or a sister, then for each of them is entitled a sixth. But they share one third if they were more than two. This is an obligation from Allah, and Allah is Knowing and Forbearing."*
> (Al Quran 4:11-12)

> *"They ask for a legal decision. Allah gives you a rule for one who has neither descendants nor ascendants. If a man only has a sister when he died, then she will have half of what he left. And he inherits from her if she has no child. But if he has two sisters or more, then two-thirds of what he left will be entitled to the sisters. If there are both brothers and sisters, the brother will have the share of two sisters. Allah makes clear to you, lest you go astray. Allah knew of all things."*
> (Al Quran 4:176)

Figure 1 illustrates the basic model that defines the levels of eligible lawful descendants and ascendants of a deceased man (Wan Harun, 2011):

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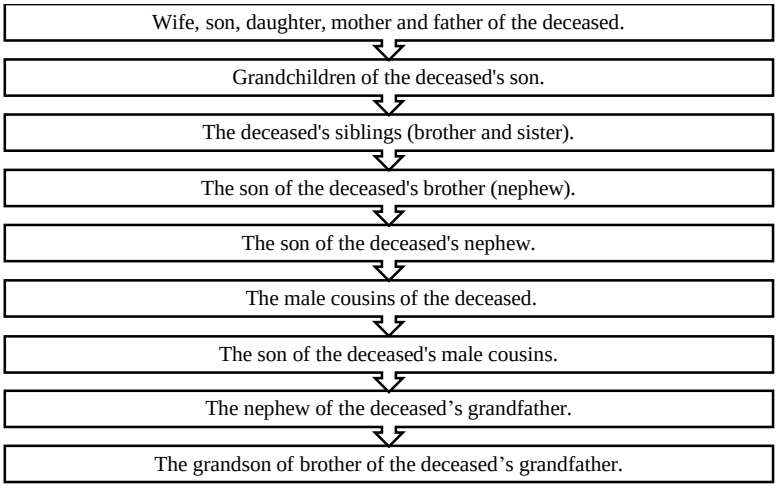

Figure 1: Level of Eligible Heirs

Table 1 displays a tabled summary of the *Faraid* allocations by Zouaoui and Rezeg (2018).

Table 1: Summary of *Faraid* Allocations in Al Qur'an

Relative Name	Deceased has no offspring	Deceased has offspring
Husband	1/2	1/4
Wife	1/4 (Divided among all wives)	1/8 (Divided among all wives)
Son	1:2 (Male and female of the same class)	1:2 (Sons and daughters)
Daughter	1/2 (Only one daughter)	2/3 (Multiple daughters)
Father	1/6	1/6
Mother	1/3	1/6
Full Sister	1/2 (Only one full sister)	2/3 (Multiple full sisters)
Maternal Sibling	1/6 (Only one maternal sibling)	1/3 (Multiple maternal siblings)

Hishamudin (2012) has listed the eligible heirs according to male and female sides, as given in Table 2. However, this list has not been ranked according to priority to receive the assets.

Table 2: List of Heirs from Male and Female Sides

Male Heirs	**Female Heirs**
Husband	Wife
Son	Daughter
Father	Mother
Son of Son	Daughter of Son
Grandfather on Father Side	Mother of Mother
Full Brother	Mother of Father
Consanguine Brother	Full Sister

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Uterine Brother	Consanguine Sister
Son of Full Brother	Uterine Sister
Son of Consanguine Brother	Female Slave Master
Full Brother of Father	
Consanguine Brother of Father	
Son of Full Brother of Father	
Son of Consanguine Brother of Father	
Male Slave Master	

Modified from Source: Hishamudin (2012)

Based on Table 2, *Faraid* rules that can be constructed are:

1) If all heirs from male side exist, the qualified heirs will only be husband, son and father.
2) If all heirs from female side exist, the heirs who will be entitled for the deceased's wealth are wife, mother, daughter, full sister and daughter of a son.
3) If all heirs from both male and female sides exist, priority of the portion will be entitled to husband or wife, son, daughter, father and mother.

Takharuj

The root word of *Takharuj* is *kharaja* which means get out (Naiimi, 2016). In general, it is the withdrawal of a qualified heir to inheritances assets and chooses to give the assets to another beneficiary whether i) voluntarily or ii) by receiving compensations from the other heirs' personal estate or the estate received from inheritance.

Suhairi (2012) stated that *Takharuj* was first experienced by Tumadir, one of four wives of Abdul Rahman bin 'Auf who was divorced before the death of her husband. There was an issue between scholars about how the inheritance assets should be divided because she was still in *'iddah*. Saidina Uthman bin Affan ruled that 1/8 of the assets of Abdul Rahman bin 'Auf to be divided equally among his four wives, married or divorced. Tumadir withdrew from taking her portion and received eighty-three thousand *dirhams* as compensation.

Ali and Ahmad (2013) defined three ways under which *Takharuj* can occur:

i) between two heirs, with or without compensation,
ii) between an heir and the rest of the heirs, with compensation such as houses while the remaining estates are divided among the other heirs, and
iii) between an heir with the rest of the heirs, with compensation from personal property.

There are different types of *akad* which is based on how the settlement of the inheritance distribution is done (Ahmad, Jamsari, Mohd Nasir, Hehsen, & Wan Hassan, 2017):

i) *Mubadalah*: The property that will be exchanged has the same value and those properties will be given based on value as agreed between heirs.
ii) *Mu'awaddah*: The estate is given to the one who withdraw from receiving the inheritance and those estates are replaced by any property in the inheritance assets or personal property.

iii) *Ibra'*: An heir gives a portion of his assets and keeps his right on the other property.

The minimum width of land required to be categorized as productive land is 0.4 hectare (Rusnadewi Abdul Rashid & Ahmad, 2010). Table 3 displays the consequences of adhering strictly and solely to the *Faraid* rules. Here, all daughters are entitled to 0.3125 hectare of land each. However, these lands (highlighted in yellow) are not economical to be developed.

Table 3: Illustration - Outcome from Strict Compliance to Basic *Faraid* System

Ownership Number	Heirs	*Faraid* Portions	Width of Land (Hectares)
Agricultural Land (Width: 2.5 hectares) Ownership number GM500 Lot 88 Mukim Paloh	Faisal Bin Mohd	2/8	0.625
	Firdaus Bin Mohd	2/8	0.625
	Sufia Binti Mohd	1/8	0.3125
	Suriya Binti Mohd	1/8	0.3125
	Sabrina Binti Mohd	1/8	0.3125
	Surina Binti Mohd	1/8	0.3125

Source: Wan Harun (2011)

Scope and Limitation of the Current Research

The number of Malaysians using Takharuj in Pahang, Kuala Terengganu, Kelantan and Johor has increased (Ahmad et al., 2017). The agreement to use *Takharuj* was done during the mediation sessions to divide estates. However, the agreed portions may not have been the optimal solution since there was no mathematical model applied. There is also no research done on mathematical model involving *Takharuj* concept. Therefore, it would be a great advantage to all parties involved if a mathematical model can be constructed to optimize the land distribution and land use. Therefore, this research has chosen to use Goal Programming (GP) because of the ability of this method to achieve multiple conflicting goals simultaneously.

There are a few shortcomings in the purpose of optimizing land distribution. Wasted unproductive land is one of the by-products of the current implementation system for *Faraid*. The research is only focused in Malaysia. Therefore, the current research will define, model and provide solution to some of the shortcomings of the existing *Faraid* system. This basic model is constrained by the following assumptions:

i) all debts left by the deceased have been fully paid before distributing the inheritance assets,

ii) the portion for distributing the inheritance assets is only based on *Faraid* shares,

iii) the case research sets a limit where second cousins will be the last descendants who are qualified as heirs,

iv) all ascendants who are qualified as heirs are considered dead except for the parents of the deceased,

v) adopted children will not be counted as eligible heirs,

vi) the case research only focused on land as the inheritance asset to be distributed,

vii) paternal or maternal relationships will not be considered,

viii) there is no compensation for the *Takharuj* process to be considered,

ix) maximum number of heirs who are able to give up their portion of land for combination purposes is limited to fourteen persons,

x) There must be at least one heir with the portion of land size less than 0.4 hectare left in each combination to receive the portion from the heirs who willingly to give up their portion,

xi) the application of *Takharuj* principle is limited to fourteen heirs only for one computation as fourteen is the highest number of heirs based on the data collected,

xii) the heirs with a portion of arable land size cannot receive or give up their portion, and

xiii) location of the distributed land for each case is in the same lot.

Existing Method on Land Optimization

A simple gap analysis was done involving some past research works, as displayed in Table 4.

Table 4: Gap Analysis on Previous Method Used in Land Optimization

Types of Method	Author								This research
	1	2	3	4	5	6	7	8	
Linear Programming (LP)								√	
Goal Programming (GP)	√		√	√	√	√			√
Fuzzy Goal Programming (FGP)							√		
Zero-One Multiobjective Programming (ZOGP)		√							

Note: [1] Latinopoulos & Mylopoulos (2005)
[2] Ligmann-Zielinska, Church & Jankowski (2005)
[3] Sadeghi, Jalili & Nikkami (2009)
[4] Sen and Nandi (2012)
[5] Dave (2015)
[6] Gamage (2017)
[7] Heydari, Honarbakhsh, Pajoohesh, and Zangiabadi (2018)
[8] Zenis, Supian & Lesmana (2018)

Findings of the analysis confirm that majority of the researchers used GP to optimize land allocation. Therefore, this research considered that GP can be used to optimize land distribution using *Takharuj* principle is GP.

GP was introduced by Charnes in the 1950s as the extension from Linear Programming (LP) which was normally used to analyse and solve problem with several objectives simultaneously (Colapinto, Jayaraman, & Marsiglio, 2017). It is a simple mathematical model, thus it became popular and is widely used. It is also easy to understand and needs less computational effort. It is one of the oldest multi-criteria decision-making method used. Agriculture planning is the research topic which often uses GP as solution method.

Sen and Nandi (2012) explained that GP will not directly optimize the objectives as LP does. It solves problems that LP is unable to solve like infeasible LP problems. It differs from other mathematical programming in that decision variables in the objective function are replaced by deviation variables. It can be solved using other algorithms like pre-emptive and weights method. Pre-emptive method focuses on prioritizing the goals based on the rank of importance. In weights method, single objective function is formulated as the weighted sum of the functions to represent the research goal. However, neither of these methods is better than the other since both methods achieve different preferences in decision making (Taha, 2011). As examples, pre-emptive method found the optimal allocation of land for five different field crops (Gamage, 2017) while the weight method found the optimal allocation of land and water resources in irrigated agriculture (Latinopoulos & Mylopoulos, 2005).

Methodology

Phase I: Problem Identification

This research concerned cases where the land distributed to the qualified heirs from previous *Faraid* cases was uneconomical to be developed. Normally, they will be abandoned as no effective management can be done with too many names in the title. Table 5 illustrates a sample case involving 10 heirs (two daughters, five grandsons and three granddaughters). Here, the allocations to heirs are achieved based on strict compliance to Basic *Faraid* System. Most of the heirs received the portion of inheritance where the land size can be considered as unproductive, as highlighted in yellow.

Table 5: Illustration - Outcome from Strict Compliance to Basic *Faraid* System to Current Case Research

Ownership Number	**Relationship with the Deceased**	***Faraid* Portions**	**Width of Land (Hectares)**
Agricultural Land (Width: 1.7366 hectares) Ownership number SP 4828 Mukim Mergong	Daughter	104/416	0.43415
	Daughter	104/416	0.43415
	Grandson	32/416	0.1336
	Grandson	32/416	0.1336
	Grandson	32/416	0.1336
	Grandson	32/416	0.1336
	Grandson	32/416	0.1336
	Granddaughter	16/416	0.0668
	Granddaughter	16/416	0.0668
	Granddaughter	16/416	0.0668

Source: Original Data

Phase II: Data Analysis

Secondary data (45 sample cases of inheritance distribution data) were obtained from Land Registry Office at Alor Setar, Kedah. The data required were the number of legal heirs, land width, relationship between heirs and the deceased and *Faraid* portion received. The data presented cases where all heirs do not give up their portion of land since it was already considered as size of arable land. For instance, 10 qualified heirs to a 10.8332-hectare land can each receive a minimum of 0.7222 hectare which was arable land size as it is larger than 0.4 hectare. There were also several cases (such as sample case in Table 5) where a piece of small-sized land was owned by too many heirs. It required almost everyone to give up their land portion in

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order to ensure the land was sufficient in size to be categorized as productive land. The data also showed that *Faraid* and *Takharuj* were implemented during the distribution processes. However, the division of land was made without considering certain aspects such as the land width and the number of qualified heirs to the assets. Consequently, many lands were made unproductive for development as the size was too small after distribution.

Phase III: Model Formulation

This research aimed to formulate *Takharuj*-based mathematical model by using equal weights method of GP. Constraints related to land width, number of heirs and portion of land entitled to the qualified heirs were considered to ensure all the combination listed were in the size of productive land. To find the optimal combination of productive land size for eligible heirs, the objective function of GP aimed to minimize the sum of the percentage deviations from the target to avoid any possible bias effect of the solution.

Phase IV: Computational Experiment and Analysis of Results

MATLAB software was used to run some computational experiments for the purpose of generating the list of all the possible combinations of arable land size between heirs, using implementation steps in Table 6. These steps were converted into written codes to list all possible combinations needed for selection. It is highly emphasized here that heirs left after combination received inheritance portion in the form of arable land size.

Table 6: Steps to Obtain Possible Combinations of Arable Land Size

Step 1	:	Enter total width of land in hectares for each case
Step 2	:	Enter total number of heirs who owned a piece of land
Step 3	:	Enter portion of land entitled to each heir for each data set in the form of fraction
Step 4	:	Enter portion of land entitled to each heir in the form of land size (in hectares) for each case
	:	Portion of land entitled to each heir (in hectares) = Portion of land entitled to each heir in the form of fraction * total width of land
Step 5	:	Calculate the total number of heirs who have portion of land less than 0.4 hectare
Step 6	:	Calculate the total sum of portion of heirs who are giving up their portion for each combination
	:	Total sum of portion of heirs who chose to give up their portion =∑ Portion of land entitled to heir who are giving up their portion (in hectares)
Step 7	:	Calculate the total width of land to be combined with the portion of heirs left for each combination
	:	Total width of land to be combined with the portion of heirs left (in hectares) = (Total sum of portion of heirs who are giving up their portion / total number of heirs who have portion of land less than 0.4 hectares – total number of heirs who chose to give up their portion)
Step 8	:	Compute the final portion of each heir
	:	Final portion of each heir (in hectares) = Total width of land to be combined with the portion of heirs left (in hectares) + Portion of heirs who chose not to give up their portion (in hectares)
Step 9	:	List the possible combinations of arable land size

The computation run in MATLAB successfully listed all possible combinations of arable land size between heirs based on listed criteria:

i) the only persons who can withdraw from their portion are the heirs who are entitled portion of land less than 0.4 hectare (upper limit 0.4 hectare is considered as productive-sized land (Rusnadewi Abdul Rashid & Ahmad, 2010),

ii) the heirs who already have portion of land more than 0.4 hectare cannot give up or receive portion anymore,

iii) the total portion of land of each heir after combination based on *Faraid* portion and *Takharuj* portion must be equal to one, such that

If P_i = suggested fractional *Faraid* portion and S = sum of all fractional *Faraid* portion,

then $S = P_1 + P_2 + \cdots + P_n = 1$.

iv) the portion of land before and after combination for each heir must be more or equal to one-eighth (the minimum *Faraid* portion mentioned in Al Qur'an for inheritance distribution), and

v) the total number of heirs for one computation must be less than 14 heirs (the highest number of heirs based on the data collected).

Table 7 displays implementation steps to select the optimal combination by using Excel Solver.

Table 7: Steps for Computational Approach in Excel Solver

Step 1 :	Calculate the number of heirs in the chosen combination
Step 2 :	Find the final portion of land allocated for the heirs in the selected combination
Step 3 :	Subtract the value of goal to be reached which is 0.4 from the result in step 1 to get the deviation from the goal.
Step 4 :	Calculate the total sum of deviations
Step 5 :	Compute the percentage deviation number of heirs from minimum number of heirs in one combination of each data set
Step 6 :	Find the sum of weighted deviations for the chosen combination.

Results and Discussion

Figure 2 shows the result of the list of possible combinations for data in Table 5 which ensures each heir left received the size of arable land. Two daughters have already received productive sized portions (0.4341 hectare each), thus their land portion remained the same throughout the whole computation process. Negotiations are made between all grandsons and granddaughters with 0.1336 and 0.0668 hectares each, respectively. Possible combinations are given in Table 8.

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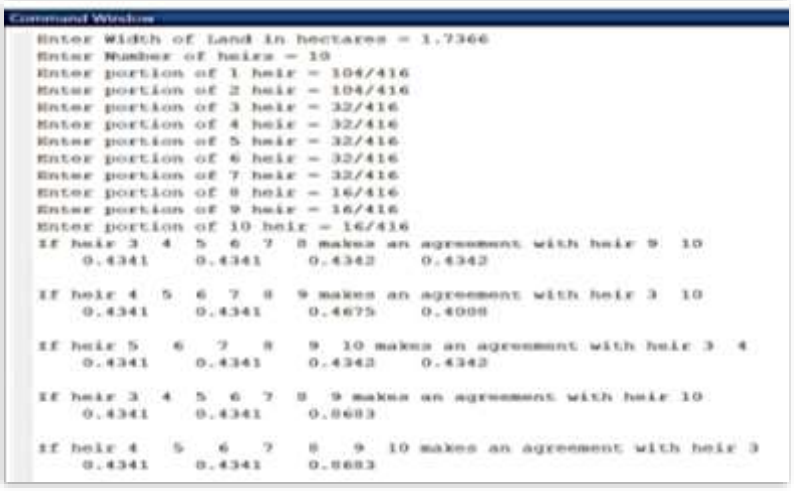

Figure 2: Sample Result of List of Possible Combination

Table 8: Possible Combinations with Criteria

Combination 1	**If all grandsons and one granddaughter give up their portions to both granddaughters left, then each heir is entitled to approximately 0.4341 hectare each.**
Combination 2	If four grandsons and two granddaughters waive their rights to inherit, their portions, the grandson and granddaughter will receive land of arable size.
Combination 3	If three grandsons and three granddaughters give up their *Faraid*-based land portion, then two grandsons will get 0.4342 hectare each.
Combination 4	If all grandsons and two granddaughters are willing to waive their portions, one granddaughter will receive a combined total of 0.8683 hectare.
Combination 5	If four grandsons and all granddaughters combined their portion with the only grandson left, then the only heir left gets 0.8683 hectare.

The number left to receive the land portion for the first three combinations were four persons while only three beneficiaries are entitled after the last two combinations. These combinations needed six and seven heirs to give up their portion. If less than six heirs waive their portions, the land size will not be sufficient for productivity.

In Excel Solver, all calculations are run separately for each data set that consists several possible combinations which taken from the final result of the previous section. Figure 3 shows which combination amongst all the possible combinations was the optimal one, by allowing the result to stay as close as possible to the goals while satisfying all the constraints. The selected combination in this case was the second combination. The selection was depended on the goal which was to minimize the number of heirs who owned the piece of land after combination. However, since this research aimed to use goal programming model, then it cannot directly ask the model to minimize the number of heirs. Therefore, it is crucial to check all the combinations and get as close to the value of arable land size as possible by minimizing the deviation from the goals which is 0.4.

The optimal combination was the one with minimum total sum of weighted deviations. Thus, selected combination is the second option with the total weighted sum of deviation was 0.4698. This research has ensured that the optimal solution is only one combination out of all possible listed

combinations listed. From the findings, it is to be highlighted that most of the solutions in these scenarios might be multiple optimal because it can simply create a replica of one combination in which heir 1 can share his land portion with heir 2 instead of heir 3 where both heir 2 and heir 3 have same individual portion. This way the optimal selection will have the same end result but a different combination.

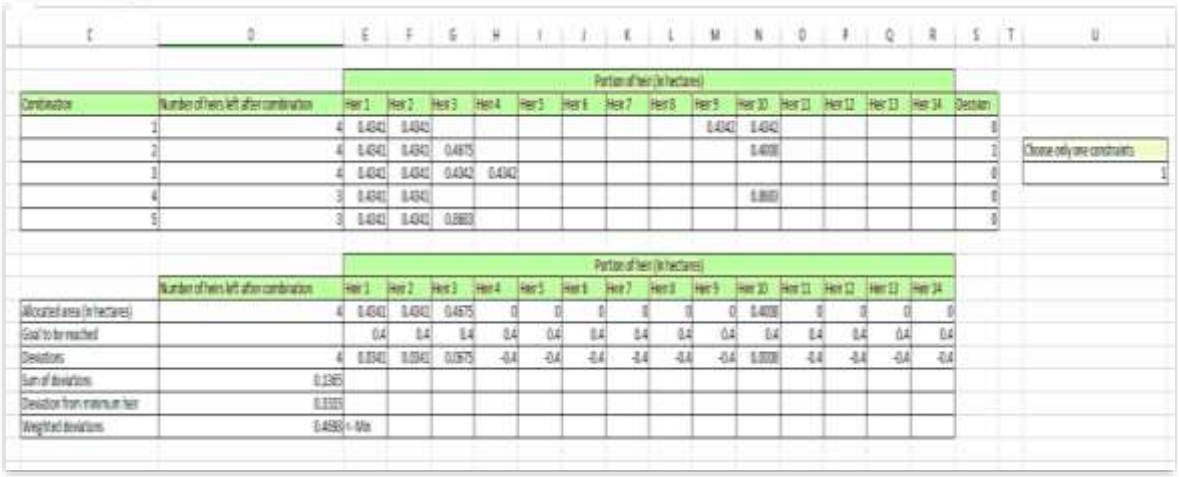

Figure 3: Sample Result of Optimal Combination Selection

Conclusion

This research aimed to lessen the number of unclaimed inheritance assets in Malaysia and reduce the number of wasted lands caused by inefficient inheritance distribution system by encouraging the use of *Takharuj* concept in estate distribution. The adoption of *Takharuj*-based mathematical modeling would contribute to current Islamic and also mathematical knowledge on estate distribution. Next, this system is designed to facilitate Muslims in terms of calculation of estate distribution based on *Takharuj*. It is also to increase awareness of Muslims about the rarely known concept of *Takharuj*. Not only can the Muslims be aware of other ways to divide land, they are also able to harmoniously settle any inheritance cases.

This *Takharuj*-based GP mathematical model has succeeded at achieving both objectives. All cases from the data collected for this research have been solved by listing the possible combinations to ensure that the land portion received by the heirs left were of arable land size. The optimal selection of the available combinations has also been made by choosing the one with the minimum total sum of weighted deviations. The goals set were to minimize the deviation from the value of productive land size and to minimize the number of heirs who owned the piece of land after combination.

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