

Optimization of Assignment Plan of Workers to Jobs in Kere Farms

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Abstract— Large poultry farms usually face problems with carrying out their operations. In such environments, timeliness of these operations usually are the deciding factor between healthy and unhealthy birds and bird products. Certain expertise in optimization is often required for successful solution to these problems. In this paper, we attempted to optimize the operations of a poultry farm- Princess Kere Farms by determining the correct assignment of workers to jobs that will minimize labor hours. Hungarian technique was used to model the assignment plan of Princess Kere farms. The resulting model was solved and the optimal value obtained shows a reduction in total minutes spent doing collective jobs on the farm

Index Terms— Assignment plan, Hungarian technique, Optimization.

I. INTRODUCTION

Production systems are regions of operations research that focuses on certifiable operational issues. Production arranging is concerned basically with the adjustment of the modern constrained assets of the firm keeping in mind the end goal to fulfill interest for its products. (Bruce R. Feiring, 1991; Shapiro, J.F., 1993). The accompanying settings, among others, more often than not create production frameworks issues: fabricating, broadcast communications, human services conveyance, office area and design, and staffing (Hillier, F., and Lieberman, G., 2001). Operations research basics are required to take care of production issues since they are operations research problems. Also, the arrangement of creation frameworks issues as often as possible attracts on mastery more than one of the essential regions of operations research, suggesting that the fruitful generation scientist can't be one-dimensional (Banks, J., Carson II J., and Nelson, B., 1995; Taha, H. A., 2002). With a specific end goal to take care of creation issues, a top to bottom comprehension of the genuine issue is required, since invoking assumptions that simplify the mathematical structure of the problem may lead to an elegant solution for the wrong problem. Basic properties of effective production

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organizers are presence of mind and commonsense understanding (Hillier, F., and Lieberman, G., 2001; Epply, T., 2004). Outline target could be basically to limit the cost of creation or to maximize the efficiency of production (Agarana, M.C. Anake T.A., and Adeleke O.J., 2014). An optimization algorithm is a procedure which is executed iteratively by comparing various solutions till an optimum or a satisfactory solution is found. Optimization or mathematical programming is the selection of a best element (with regard to some criteria) from some set of available alternatives (Ofori S., 2013). In the simplest case, an optimization problem consists of maximizing or minimizing a real function by systematically choosing input values from within an allowed set and computing the value of the function (Voss, C., Tsiriktsis, N. & Frohlich, M. 2002). The speculation of optimization theory and methods to different details includes an expansive zone of connected arithmetic. All the more by and large, improvement incorporates discovering "best accessible" estimations of some target capacities given a characterized space (or an arrangement of requirements), including a wide range of sorts of objective functions and diverse kinds of domains (Fagotinbo, I. S., Akinbo, R. Y., Ajibode, I. A., Olaniran Y. O. A., 2011). Princess Kere farms is an agricultural company that deals solely on the production of large scale poultry produce and birds for rearing or consumption. Being a small outfit, it employs a number of employees that cater to the needs of the farm as a whole as regards the day to day running of the business. The farm employs six workers who carry out these daily functions of the business. In this paper attempt is made to maximize the assignment plan of workers to jobs that can result in the least total labour hours. Problem forms one to one basis. This is an assignment problem..

II. RELATED WORK

The assignment problem (AP) is a special type of linear programming problem (LPP) in which our objective is to assign number of jobs to number of workers at a minimum cost (time). The mathematical formulation of the problem suggests that this is a 0-1 programming problem and is highly degenerate all the algorithms developed to find optimal solution of transportation problem are applicable to assignment problem. However, due to its highly degeneracy nature a specially designed algorithm, widely known as Hungarian method proposed by (Kuhn, 1995), is used for its solution. The assignment problem, also known as the maximum weighted bipartite matching problem, is a widely-studied problem applicable to many domains

(Burkard, 1999)It can also be stated as follows: given a set of workers, a set of jobs, and a set of ratings indicating how well each worker can perform each job, determine the best possible assignment of workers to jobs, such that the total rating is maximized (Munkres 1957)..

III. MODEL FORMULATION

The assignment plan of Kere farms is modeled using the data gotten from the farms for computed times taken by each worker to complete various tasks. The available resource is labour hours. They are represented by variables involved in the model formulation

A. Decision Variables

Decision variables are a set of quantities that need to be determined in order to solve the linear programming problem. They are so called because the problem is to decide what value each variable should take. Typically, the variables represent the amount of a resource to use or the level of some activity. (Agarana, M. C., Anake T.A., and Adeleke O.J. 2014)

The model is as follows:

WORKERS	ACTIVITIES					TOTAL(min)
	X1	X2	X3	X4	X5	
Joseph	25	60	40	39	30	194
Sunday	36	21	44	60	35	196
Joshua	44	30	40	35	40	179
Ubong	25	32	30	50	42	179
Ahmed	40	37	43	30	29	179

Table 1. Kere Farms Labor hours data

Where /

- x1= Cleaning of feeding troughs;
- x2= Feeding the birds
- x3=Cleaning the pen
- x4=Administering drugs
- x5=Changing the litter

To perform the optimization using the Hungarian technique, we follow the steps below:

IV. METHODOLOGY

Step 1: Perform Row Reduction for each of the rows ie subtract the least element in each row from the other elements in the same row

WORKERS	ACTIVITIES				
	X1	X2	X3	X4	X5
Joseph	0	35	15	14	5
Sunday	15	0	13	39	14
Joshua	14	0	10	5	10
Ubong	0	7	5	25	17
Ahmed	11	8	14	1	0

Step 2: Perform column reduction on the same table ie. Subtract the least element in each column from the others in that column. The resulting table is:

WORKERS	ACTIVITIES				
	X1	X2	X3	X4	X5
Joseph	0	35	10	13	5
Sunday	15	0	8	38	14
Joshua	14	0	5	4	10
Ubong	0	7	0	24	17
Ahmed	11	8	9	0	0

Step 3: now we use horizontal and vertical lines to cross out all the zeros.

WORKERS	ACTIVITIES				
	X1	X2	X3	X4	X5
Joseph	0	35	10	13	5
Sunday	15	0	8	38	14
Joshua	14	0	5	4	10
Ubong	0	7	0	24	17
Ahmed	11	8	9	0	0

Since we have four lines that cover the zeros, the solution isn't optimal because it is a 5x5 matrix, therefore we take the least values from the uncovered values and subtract it from the uncovered values and add it to the double covered values. Then we cross the zeros and have:

Joshua	44	30	40	35	40
Ubong	25	32	30	50	42
Ahmed	40	37	43	30	29

The minimum time assignment of persons to jobs is :
25+21+35+30+29= 140 minutes

VI. CONCLUSION

Data collected from Princess Kere farms was modeled into an assignment model and solved using the Hungarian technique. A primal problem was formed and being a minimization case that would be solved using the Hungarian technique. Upon obtaining the final tableau we came to the conclusion that for total labour hours to be minimized and utilized:

- Joseph → Cleaning feeding troughs
- Sunday → Feeding the birds
- Joshua → Administer drugs
- Ubong → Cleaning the Pen
- Ahmed → Cleaning water troughs

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WORKERS	ACTIVITIES				
	X1	X2	X3	X4	X5
Joseph	0	35	6	9	1
Sunday	15	0	4	34	10
Joshua	14	0	1	0	6
Ubong	4	11	0	24	17
Ahmed	15	12	9	0	0

Covering with the minimum number of lines we have 5 lines = order of the matrix. Therefore minimum assignment can be made thus:

WORKERS	ACTIVITIES				
	X1	X2	X3	X4	X5
Joseph	0	35	6	9	1
Sunday	15	0	4	34	10
Joshua	14	0	1	0	6
Ubong	4	11	0	24	17
Ahmed	15	12	9	0	0

V. RESULT ANALYSIS

Replace the zeros with the original number from the first table(original table)

WORKERS	ACTIVITIES				
	X1	X2	X3	X4	X5
Joseph	25	60	40	39	30
Sunday	36	21	44	60	35

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