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Plant Layout under Discounted Sequential Machinery Investment using Dynamic Programming Approach

Aderoba, O. A.[1] and Ogedengbe, T. I.[2]*
1,2, Mechanical Engineering Department, School of Engineering and Engineering Technology, The Federal University of Technology, PMB 704, Akure, Nigeria

Abstract: *Dynamic programming is employed in this study to develop a model that helps entrepreneurs to populate pre-planned plant layout using discounted sequential machinery investment method. The approach enables the use of little initial capital to sequentially invest in the most important machinery/machineries and factory and office space(s) as well as to provide sufficient working capital required by the industry to keep the plant working optimally per period. In addition, it takes into consideration the time value of money that may arise from inflation on the economy during the sequential investment period using discounting method. Using the developed model and a set of decision rules that was setup, total earnings obtained from previous periods are subsequently re-invested each period, while ensuring adequate working capital, until all the planned machines and factory and office buildings have been fully put in place. The model developed was implemented through a software named DYNAPLANT2015 which was developed using C# programming language to facilitate the solution procedure. An appropriate case study was used to evaluate the model and observe possible difference between the undiscounted and discounted sequential machinery investment.*
Keywords: *Plant layout, Discounting, sequential machinery investment, Dynamic programming, Entrepreneur.*

I. Introduction

Plant Layout is the physical arrangement of equipment and facilities within a plant. The basic objective of plant layout is to ensure a smooth flow of work, material, people and information. Hence, a better layout for a given plant can improve productivity, safety and quality of products. Many manufacturing facilities present a single layout type or a combination of layout types. For example, a given production area may be laid out by process, while another area may be laid out by product. It is also common to find an entire plant arranged according to product layout, for example, a parts fabrication area followed by a subassembly area, with a final assembly area at the end of the process. Different types of layouts may be used in each area, with a process layout used in fabrication, group technology in subassembly, and a product layout used in final assembly. Generally, the plant layout to be used by entrepreneurs should actually depend on the work flow of the plant and also conform to the criteria of a good plant layout.

Machinery investment for plant layout have been reported to utilize self-financing, loans from banks and other financial institutions, capital market finance, seed money and expansion capital for new firms provided by venture capitalists and private equity funds and public funds and incentives for investment from international, national, regional, local institutions [1]. However these sources of finance are not readily available in developing nations, therefore Startup funds have always been a limiting factor for the development of Industries', in developing economy like Nigeria, particularly for the procurement of fixed assets such as machines and also operating the machinery with adequate working capital. Even when commercial banks provide limited funds for working capital, it is usually at a very high interest rate on pledging building and machineries as collateral. Hence, the only option for these entrepreneurs is to start small with limited capital available by investing in buildings, machinery and provision of working capital. The hope is that the small scale starters will generate enough returns for further expansion in machinery and additional capital for working expenses.

Consequently, the investment plan under this tight circumstance must provide for a flexible plant layout that is dependent on the short term constraints of capital but mindful of the long terms needs of the functional layout of the full complement of machinery for the plant [2]. The plan must also provide for expansion in buildings in a modular form to cope with added machinery under the phased plan. This modular building expansion, machine selection for investment and provision of working capital requires a suitable systematic programming approach which will sequentially and effectively acquire and manage all resources optimally while taking into consideration possible inflation in the economy (during the waiting period) by accounting for the time value of money. For example, the inflation in Nigeria economy for the year 2015 could be taking as 9.2% [3].

Plant layout literally dealt with machinery selection or replacement which starts with the determination of the capacity required and the available capacity by deriving formulae's which established machine required for each operation [4]. Various deterministic and stochastic approaches were used to give the expected number of machines required combined with mathematical programming techniques to determine the optimal subset of machines for selection [5]. Computerized plant layout models such as CRAFT also emerged with later improvement to account for cases such as relocation. Since then, the emphasis in the literature has been shifting to more and more flexibility in layouts and use of computer as a tool to aid the planning of layouts in factories [6].

Several studies regarded machinery investment process as a single stage decision making process where all the necessary machines will be acquired at once [4, 5, 7]. This assumption is far from being valid in reality, especially with the recently not too palatable economy of developing countries around the world. Sequential selection of machines has rarely been considered in the literature except in machine replacement problems occurring as a result of adoption of new technological process which had to be executed in phases. However, while a dynamic integer model was developed using readily implementable heuristic which employs suitable decision rules for sequentially scheduling investment in machinery and building on a modular basis to promote full functionality of a job shop within the shortest possible time [2], the model do not take into consideration availability of working capital and inflation in economy which affects the time value of money.

This study therefore focuses on the development of discounted sequential machinery investment model. It presents a model for sequential and discounted scheduling of investment in machinery, building and working capital on a modular basis to promote full functionality of a plant within the shortest possible time using dynamic programming approach. Dynamic programming approach was used because it has quite a different model form than the other types of mathematical programming useful for making a set of interrelated decisions. It consists of a collection of equations that can be used to describe a sequential decision process [8] and it provides a systematic procedure for determining the combination of decisions which maximizes overall effectiveness [9].

The develop model would assist decision makers in making appropriate decision in sequentially investing at discounted value in plant machineries and factory and office spaces alongside provision of adequate working capital with respect to the plant layout. A software was developed for the implementation and rapid application of the formulated model and the model was validated using an appropriate case study. The model developed is unique in that it has considered a dynamic and concurrent investment in machinery, building space and working capital, all at discounted value, as a basis for manufacturing strategy. It specifies the schedule for acquisition of machinery accompanied with the development of the required factory space and provides for working capital. Also, it accounts for the minimum initial limited capital to invest on the plant and provide for updating this capital base for further expansion through reinvestment earnings. Furthermore the model account for the time value of money in respect of possible inflation and it utilizes essential decision rules for selecting machine(s), by priority, to be purchased in any period.

II. Material And Method

2.1 The Mathematical Model

This entails the determination of the decision variables in form of what machines (m) to purchase at a particular quarter (t), how much factory space to construct within that quarter (a_t) and how much working capital (w_t) to expend within that quarter. The underlying assumption is that whatever investments (machinery, buildings and working capital) are made, it will be completed within the quarter/period (t) and can be fully put into operation by the next quarter (t+1). The decision variables are defined symbolically as follows:

$$X_{mt} = \begin{cases} 1, & \text{if machine m is purchased in quarter t} \\ 0, & \text{if otherwise.} \end{cases}$$

$$X_{ot} = \begin{cases} 1, & \text{if office space is constructed in quarter t} \\ 0, & \text{if otherwise.} \end{cases}$$

The inherent assumption is that the final layout of the plant is known with all the data concerning the total machinery, building space and working capital. A further assumption of this model is that the required factory/building space is built in modular units and not rented. Decision rules for machine selection and a stopping rule was developed using the dynamic programming approach. The eight decision rules considered suitable for selecting machine for purchase as used in this model are as follows:

(a) Balance of production operation (note during last period which machines out of the remaining in the layout are very essential to the production activities of the factory).

(b) List machines on master layout, that are yet to be purchased in the appropriate order according to how the machines are essential to the production activities of the factory at this stage. Attach a priority value to each of the machines.
(c) Lowest value of Purchase cost, c_m
(d) Highest value of net return, r_m
(e) Highest value of return on investment, r_m/c_m
(f) Highest value of return on investment and building , $r_m/(c_m + ka_m)$
(g) Lowest value of working capital, w_t
(h) Highest Value of return on total investment , $r_m/(c_m + ka_m + w_t)$

The investment focus and its major constraints are discussed hereafter towards ensuring availability of funds for fixed/working capital to arrive at equations 1- 11.

2.2 Investment Equation

Machine index (m) of machine(s) purchased in quarter/period (t) incurs an investment cost, c_m, while constructed space of the machine, a_{mt}, used up in that quarter costs ka_{mt} and constructed office space used cost, ka_{ot}, together with a running/working capital cost, w_t. In general, total investment at any quarter/period, t (E_t) is given by;

$$E_t = [\sum_{m=1}^{M} (c_m X_{mt}) + k(a_{mt} X_{mt})] + k[\sum_{o=1}^{O} (a_{ot} X_{ot})] + w_t \quad \text{for all t} \qquad (1)$$

where M is the total number of machines being considered for investment, O is the total office space to be constructed. m and o are machine index and office space index respectively. The working Capital, w_t per quarter can be expanded further to include the recurrent expenditure and operating expenses which encompasses major factors like:

(a) Salaries, Wages and Professionals Costs, S_{wc}
(b) Raw Materials Purchase and Freight Cost, R_{wc}
(c) Utilities and Equipment Costs, U_{wc} which includes electricity, water, coolant, repairs and maintenance cost, etc.
(d) Other Expenses, O_{wc} which might include consumables; telephone cost; postage, advertisement and publicity costs; government levies and tax; insurance/health bills; and other miscellaneous expenses.

$$w_t = S_{wc} + R_{wc} + U_{wc} + O_{wc} \qquad (2)$$

2.3 Reinvested Earnings Equation

In order to achieve the net returns of a particular machine, r_m used in a given plant, a ratio of the capacity of the specific machine to the ratio of the capacities of the total number of machines in the plant is to be obtained and then multiplied by the unit price, p and the total quantity produced, q as expressed in equation (3)

$$r_m = \frac{\text{Machine Capacity of Machine m}}{\text{Total Machine Capacities of all machines required for Production}} \times p \times q \qquad (3)$$

Hence, Total net returns ploughed back for investment in quarter, t can thus be represented using (R_t), which is given by:

$$R_t = R_{t-1} + [\sum_{m=1}^{M} (r_m X_{mt})] \quad \text{for all t} \geq 1 \qquad (4)$$

2.4 Investment Funds Constraint

The value of F_t (capital available for investment in quarter, t) is the sum of capital available in quarter (t-1) i.e (F_{t-1}) and net returns for reinvestment (R_{t-1}) in that quarter less expenditure (E_{t-1}) on buildings, machineries and working capital for the quarter.

$$F_t = F_{t-1} + R_{t-1} - E_{t-1} \qquad (5)$$

The capital expenditure in turns in quarter t, E_t must be less or equal to the funds available (F_t). This constraint is expressed mathematically as:

$$E_t \leq F_t \qquad (6)$$

2.5 Space Adequacy Constraint

This constraint ensures that there is enough factory space, α_t, to accommodate any machinery, m purchased at any particular quarter/period, t and also office for the staff to manage them. This is expressed mathematically as follows:

$$\alpha_t \geq [\sum_{m=1}^{M} (a_m X_{mt})] + [\sum_{o=1}^{O} (a_o X_{ot})] \quad \text{for all t} \qquad (7)$$

2.6 Modularization of Building Space

Equation 7 mathematical formulation suggests that the size of the building space constructed in quarter t (a_t) could take any real magnitude, but it is normally dependent on the space area occupied by the selected type and number of machine(s) as well as staff office. The building is best in modular form with each new space being an integral multiplier of a standard modular space of Q. Hence,

$a_t = y_t Q$ (8)

Where Q is a standard modular space and y_t is an integer which can take any of the values 0, 1,…Expansion can then take place in multiples of Q.

There is a need to put an upper limit on the space expansion, i.e

$\sum_{t=1}^{T} (a_t) \leq \Omega$ (9)

Where Ω is the total space planned for the factory derivable from the chosen plant layout.

The formulation in equations 1 to 9 is the combined with the objective function of ensuring that the plant is fully functional and equipped within the shortest possible period of time, T, with full provision of machinery, building space and adequate working capital. This can be expressed as:

Minimise T Such that $[\sum_{t=1}^{T} (X_{mt}) = M]$ (10)

and $[\sum_{o=1}^{O} (X_{ot}) = O]$ (11)

Subject to:

$E_t = [\sum_{m=1}^{M} (c_m X_{mt}) + k(a_{mt} X_{mt})] + k[\sum_{o=1}^{O} (a_{ot} X_{ot})] + w_t$ for all t

$R_t = R_{t-1} + [\sum_{m=1}^{M} (r_m X_{mt})]$ for all t ≥1

$F_t = F_{t-1} + R_{t-1} - E_{t-1}$

$E_t \leq F_t$

$\alpha_t \geq [\sum_{m=1}^{M} (a_m X_{mt})] + [\sum_{o=1}^{O} (a_o X_{ot})]$ for all t

$a_t = y_t Q$

$\sum_{t=1}^{T} (a_t) \leq \Omega$

2.7 Discounting of investment costs and revenues

Sequential machinery investment (SMI) for populating a targeted plant layout would occur over time/period. However, as the value of money changes over time - due to the effects of inflation on economy - the value of a cost or benefit in the future may not be representative of the actual worth of that cost or benefit/revenue in present terms [10]. For this reason, it is necessary to discount the future values of costs and benefits occurring over time to a common metric known as the present value. This is introduced into the necessary components of the model formulated to enable the calculation of the present value (PV). PV is the current equivalent monetary value of a cost or benefit/revenue that will be received in the future. This is estimated by multiplying the cost and/or revenue in each period by a time dependent weight or discounting factor,d, as given in equations 12 and 13.

$PVCR_t = d_t FVCR_t$ (12)

The discounting factor is as given in Equation (13)

$d_t = \frac{1}{(1+r)^{t-1}}$ (13)

Where, $PVCR_t$ is the present value of cost/revenue component of investment in monetary terms at period t , $FVCR_t$ is the future value of cost/revenue component of investment in monetary terms at period t, r is the rate of discount and t is the number of periods under consideration.

Equations 12 and 13 were applied to both the cost and the revenue components of sequential machinery investment to discount them to the expected actual value at period t.

2.8 Model Solution Procedure

Owing to the peculiar nature of the developed model, a heuristic was developed to solve the system problem. The steps of the heuristic are summarized as follows.

C System Data Input

Step 10: Input General factory Data: F_0, α_t, Ω, k, Q, r

Step 20: Input all machinery data: c_m, a_m, r_m ; for all m ϵ M

C Decision rules for machine selection

Step 30: Calculate decision index for all machineries

Step 40: Create file SELECT and list machineries in descending order of decision index

C System initialization

Step 50: Initialize time t = 0

Step 60: Set $x_{mt} = 0$, $\alpha_t = 0$, $a_t = 0$ for all m, t

C Machinery selection, space development and sequential investment procedure

Step 70: Increase t by 1 i.e t = t+1

Step 80: Select first machinery on file SELECT

Step 90: Calculate ploughed-back returns available from preceding quarter R_{t-1}
Step 100: Update investment funds, F_t
Step 110: Determine the minimum additional space to accommodate this machinery, i.e $y_t Q$ ($y_t = 0,1,2,\ldots$)
Step 120: If available fund is insufficient to purchase and run the machinery in this quarter, go to step 190 (i.e $F_t < c_m + w_c + ky_tQ$)
Step 130: Purchase this machinery in this quarter, i.e $x_{mt} = 1$
Step 140: Review existing building space in this quarter, i.e increase a_t by y_t Q
Step 150: Upgrade available space α_t by y_tQ less a_m
Step 155: calculate and adjust, by discounting, the cost(s) and the revenue(s)
Step 160: Reduce available funds by $c_m + w_t + ka_t$ i.e $F_t = F_t - (c_m + w_t + ka_t)$
Step 170: Upgrade machinery status to 'purchased and installed' i.e $X_{mt} = 1$
Step 180: Remove machinery from file SELECT and go to step 200
Step 190: Set $X_{mt} = 0$, i.e do not purchase this machinery at this quarter
Step 200: If the present candidate machinery is the last on file SELECT, go to Step 220.
Step 210: Select next machinery on the list in SELECT; go to step 100

C Stopping Rule

Step 220: If file select is empty, go to Step 240
Step 230: Go to Step 70
Step 240: Set T (the Scheduled time for full factory functionality) = t
Step 250: Print T and the scheduled $\{X_{mt}\}$, A_t,
Step 260: STOP

III. Model Implementation

A software named DYNAPLANT2015 have been developed and improved for implementing the model, using C# programming language, to facilitate the solution procedure. The programming language is suitable for this algorithm because it provides better mathematical computation. Also, it is easy to setup user friendly interface with it. The developed software has a login page for authenticating user access. After login into the software a graphical user interface (GUI) that allows the user to either start a new project or continue with an existing project is loaded. Resuming an existing project leads to a dropdown menu indicating all the projects saved in the software database which can be recalled while the starting a fresh project command enables the user to create and name a project inside the project Name box. When starting a project afresh the general factory data GUI (Fig. 1) is loaded and required to be filled.

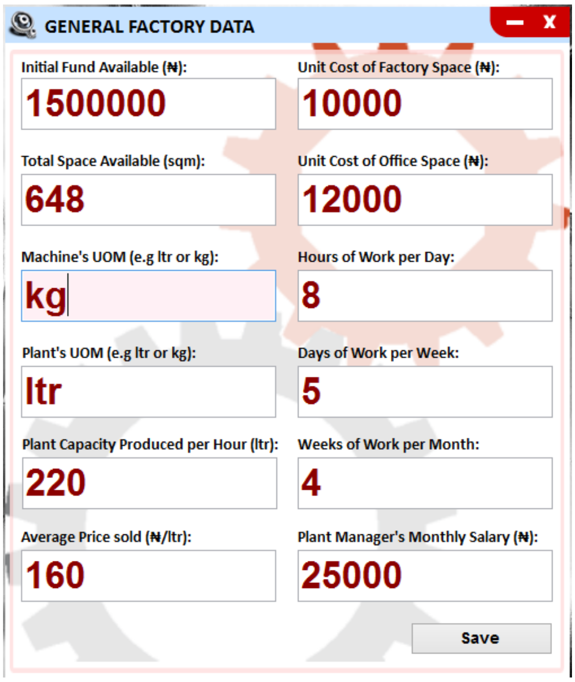


Fig. 1: General factory data GUI

Here essential information about the entire factory as reflected in the Figure is expected to be supplied. Clicking SAVE on Fig. 1 would load a confirmation GUI where a summary of data inputted in Fig. 1 is confirmed resulting in machine details GUI (Fig. 2) being loaded for necessary information to be filled in. Also to be supplied here are information related to each machine within the layout of the factory such as name, cost, usage, capacity, space required, operator's stipend, etc as shown.

After providing the details for all the machines in the layout and confirming them, the priority level GUI is loaded (Fig. 3). Here questions are asked regarding all individual machines inputted into the software to determine priority levels for each machine.

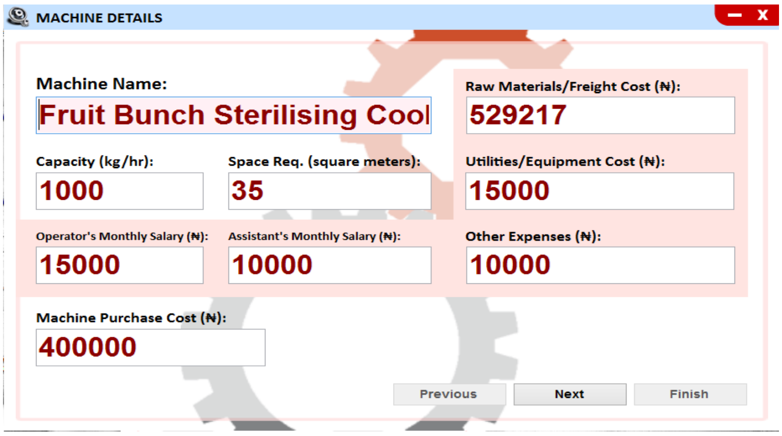
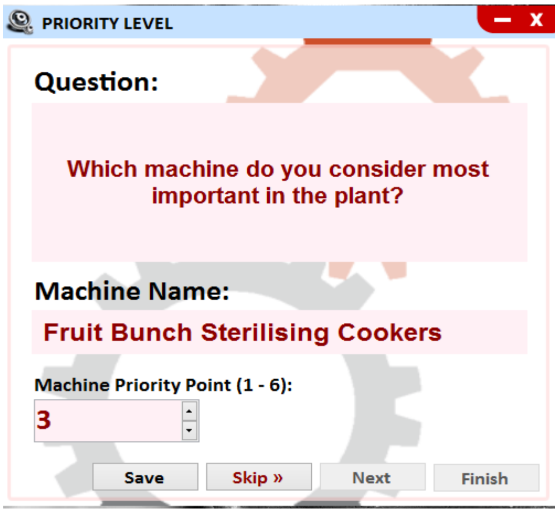


Fig. 2: Machine details GUI

The user uses the information displayed on Fig. 3 to guide his decision in answering the machine priority points for each machine. The entrepreneur also has the option of skipping a particular question by clicking on the skip button if it pleases him/her to move on to the next available question. Once all questions displayed by the software have all been answered, the finish button enables for the submission of all answers. Thereafter the software processes the user's answers and displays a summary of it which should again be confirmed, after which Fig. 4 is loaded.



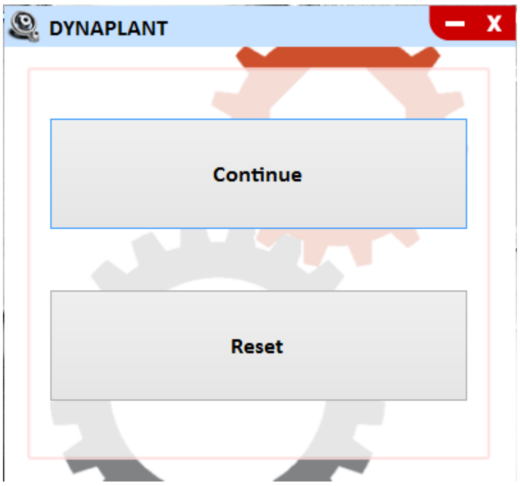


Fig. 3: Priority level GUI

Fig. 4: DYNAPLANT2015 continuation GUI

Selecting the 'CONTINUE' button in Fig. 4 automatically directs the user to the decision table section of the software which would normally provides a brief summary of the initial available fund (startup capital) as specified by the entrepreneur, the suggested machine(s) to purchase as determined by the priority levels and the net return on Investment, the total expense for that period and the total fund remaining. It also enables the entrepreneur to determine whether to continue with the purchase or not. However, if the initial fund was not sufficient to start up the plant, the software would inform its user that the initial capital inputted was not enough to purchase the suggested machine(s).

The software and model were evaluated and validated using a case study of a mini palm oil mill plant. The mini palm oil mill plant with a plant layout design of 540 square meters land size is located in Bayelsa State, Nigeria. The mills were designed specifically for the palm oil sectors and environment of Nigeria where small-to-medium scale production prevails over large scale industrial mass-production. The machineries essential for full functioning of the plant are: (1) sterilizing cooker; (2) revolving drum thresher/stripping machine; (3) fruit digester; (4) Hydraulic press machine; (5) clarifier and drying machine and (6) drain and storage tanks. The palm oil mill plant was chosen because it uses a technology that enables extraction of up to 80% oil from oil palm fruit using a modular mini plant mill. It was also selected because the end product which is palm oil is readily needed in our local environment and the traditional methods of extracting this product can easily be replaced with modern method at a very minimal cost and within the shortest possible time. Questionnaires were administered and other necessary information gathered to estimate the values of components of the developed SMI model in respect of the case study. Values obtained were used to run the software and conduct manual computation to implement the model on the case study.

IV. Result And Discussion

The values of the decision variables and the subsequent decisions on the undiscounted SMI compiled from manual computation, when r is set to zero, as displayed on Table 1 was found to be in agreement with the computation done by the software as summarized on Figs 5 to 10. The DYNAPLANT2015 software made the computation to be easier and faster with great accuracy.

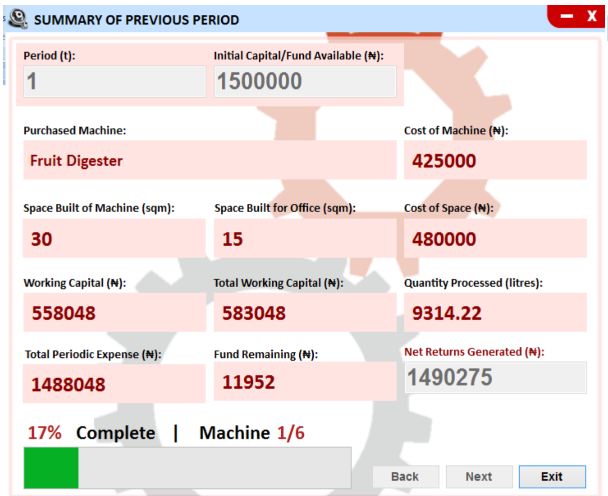


Fig. 5: Summary of Period 1

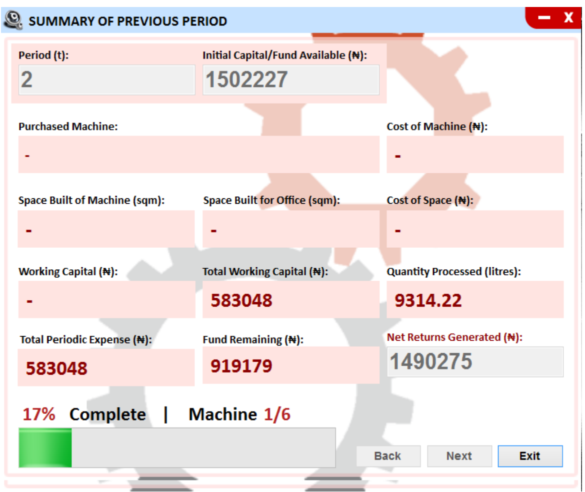


Fig. 6: Summary of Period 2

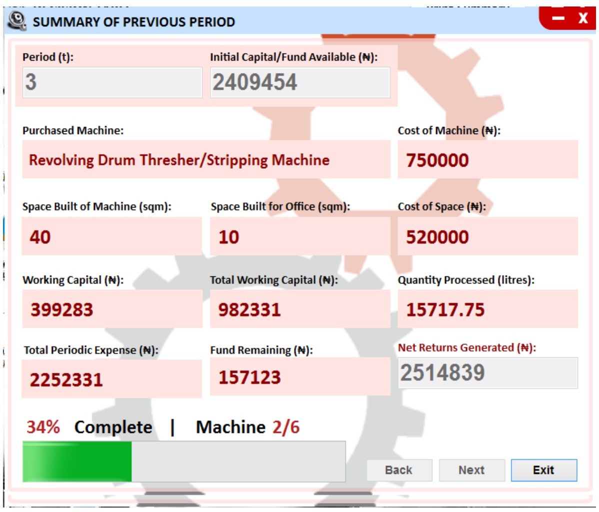


Fig. 7: Summary of Period 3

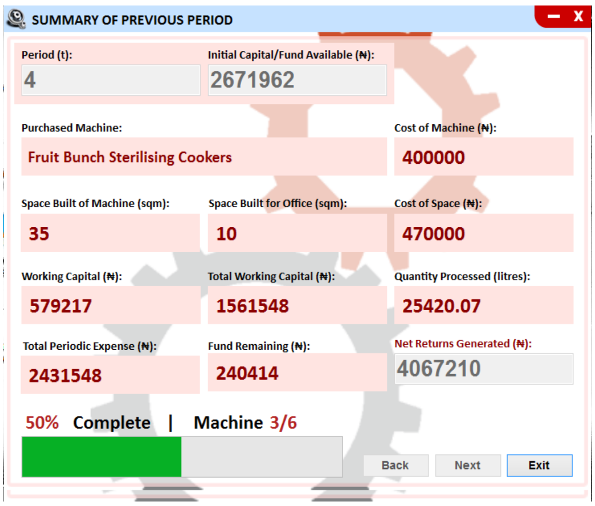


Fig. 8: Summary of Period 4

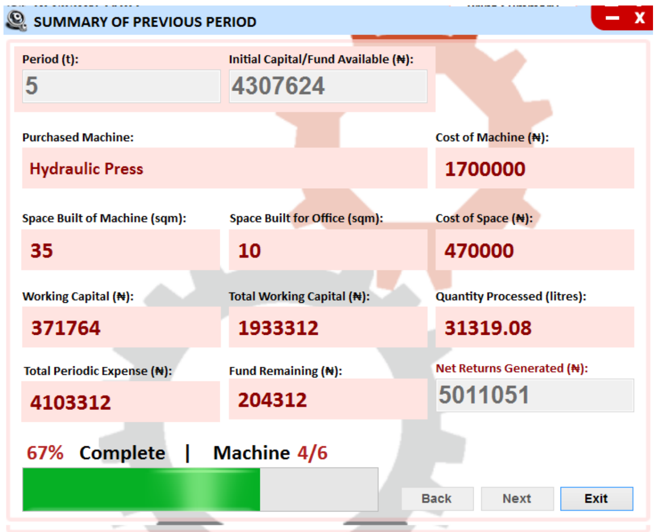


Fig. 9: Summary of Period 5

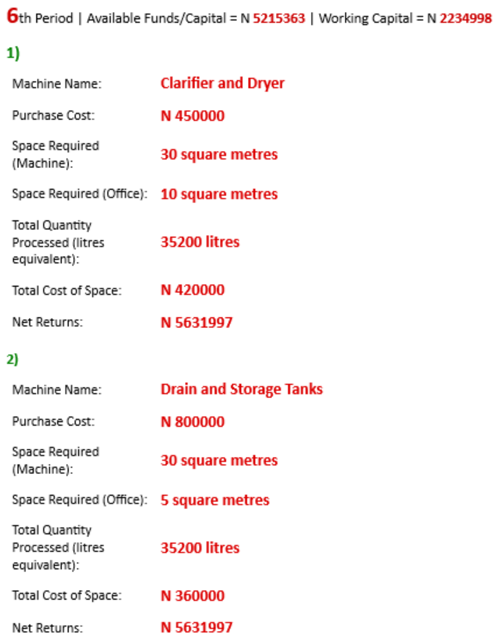


Fig. 10: Summary of Period 6

If the entire plant was to be setup at once, the total cost of setting it up would amount to a minimum capital of N7,378,048 arising from the total cost of space built, the total cost of machineries purchased and the working capital for at least the first quarter/period as presented in Table 1. However, results of this study shows that the application of the model can bring down the initial capital investment to N1,500,000.

An initial available capital of an estimated value of at least N1,500,000 would be needed to startup the plant in line with the decision rules of the developed model. This is because the model has used its decision rules to select the first machinery to purchase. The minimum total costs hereby accompanied with the selected machine(s) would involve the purchase cost of the machine(s) selected together with all the working capital running costs of the machine and the total cost of constructing an applicable plant and office space to accommodate both machine and personnel needed.

The minimum startup capital, period 1, was the same for both undiscounted and discounted sequential machinery investment as presented on Tables 1 and 2 respectively. This is because the discounting factor returns a value of one for both cases at startup period. The rate of discount is set at 2.3% for the quarterly period used for the case study as the year-to-year inflation in Nigeria is 9.2% at present. Table 1 shows that the undiscounted investment was able to achieve the completion of the plant layout of the case study within six (6) quarterly periods while, in Table 2, the discounted one was achieved the completion of the same layout in eight (8) periods when the time value of money is considered.

The case study was not able to purchase any machinery in period 2 (as in Table 1) when the investment was not discounted. This is as a result of the necessary SMI model constraint excluding discounting. When the discounting component of the SMI model is activated, Table 2 shows that machinery was not purchased not only in period 2, but also in periods 4 and 6 thereby pushing the plant layout completion to eight quarterly periods. This is due to the combined effect of discounting and other model constraints and it revealed the significance of discounting the costs and returns components of the SMI model. The introduction of discounting enables the model to become more critical and reliable through the consideration of the time value of money while waiting to completely populate the plant layout. Note that Naira (N) is Nigeria currency presently having an exchange rate of 199.05 to a US dollar (USD).

V. Conclusion

This research provides necessary logistics towards alleviating the common fears of startup of industries by small/medium scale entrepreneurs. It helps the entrepreneur in incorporating the approaches of dynamic programming to sequentially invest in machineries needed, construction of building space and providing working capital to reach the project completion time at the shortest possible time. It also takes into consideration the time value of money during the waiting periods towards plant layout completion.

Table 1: Details of the undiscounted sequential machinery investment for the case study (r = 0 per period)

Period (t)	Capital Available (Naira)	Machine Purchased	Machine Space Built (m^2)	Office Space Built (m^2)	Total Cost of Space Built (Naira)	Total Cost of Machine (s) (Naira)	Total Working Capital, (Naira)	Total Periodic Expenses (Naira)	Balance (Naira)	Quantity Processed (litre)	Price (N/litre)	Net Returns Generated r_m (Naira)
1	1,500,000	Fruit Digester	30	15	480,000	425,000	583,048	1,488,048	11,952	9,314.22	160	1,490,275.20
2	1,502,227.20	-	-		-	-	583,048	583,048	919,179.20	9,314.22	160	1,490,275.20
3	2,409,454.40	Revolving Drum Thresher/ Stripping Machine	40	10	520,000	750,000	982,331	2,252,331	157,123.40	15,717.75	160	2,514,840.00
4	2,671,963.40	Fruit Bunch Sterilizing Cookers	35	10	470,000	400,000	1,561,548	2,431,548	240,415.40	25,420.07	160	4,067,211.20
5	4,307,626.60	Hydraulic Press	35	10	470,000	1,700,000	1,933,312	4,103,312	204,314.60	31,319.08	160	5,011,052.80
6	5,215,367.40	Clarifier & Dryer; Drain & Storage Tanks	60	15	780,000	1250,000	2,065,309	4,095,309	1,120,058.40	35,200	160	5,632,000
	6,146,775.89	**Layout Completed**										

Table 2: Details of the discounted sequential machinery investment for the case study (r = 0.023 per period)

Period (t)	Capital Available (Naira)	Machine Purchased	Machine Space Built (m^2)	Office Space Built (m^2)	Total Cost of Space Built (Naira)	Total Cost of Machine (s) (Naira)	Total Working Capital, (Naira)	Total Periodic Expenses (Naira)	Balance (Naira)	Quantity Processed (litres)	Price (N/litre)	Net Returns Generated r_m (Naira)
1	1,500,000	Fruit Digester	30	15	480,000	425,000	583,048	1,488,048	11,952	9,314.22	160	1,490,275
2	1,502,227	-	-	-	-	-	596,458.1	596,458.1	905,769.1	9,314.22	160	1,456,770
3	2,362,539	Revolving Drum Thresher/ Stripping Machine	40	10	544,195.1	784,896.8	1,028,038	2,357,130	5,408.88	15,717.75	160	2,403,029
4	2,408,438	-	-	-	-	-	1,051,683	1,051,683	1,356,756	15,717.75	160	2,349,002
5	3,705,758	Fruit Bunch Sterilizing Cookers	35	10	514,754.8	438,089.2	1,710,243	2,663,087	1,042,671	25,420.07	160	3,713,592
6	4,756,263	-	-	-	-	-	1,749,579	1,749,579	3,006,684	25,420.07	160	3,630,100
7	6,636,784	Hydraulic Press	35	10	538,705.8	1,948,510	2,215,929	4,703,145	1,933,639	31,319.08	160	4,371,950
8	6,305,589	Clarifier & Dryer; Drain & Storage	60	15	914,584.9	1,465,681	2,421,667	4,801,933	1,503,656	35,200	160	4,803,228
	6,306,884	**Layout Completed**										

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