ORIGINAL ARTICLE

Developing Palm Oil Inventory Control System Using Ms Excel Macro

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ABSTRACT – The palm oil sector is just one of the popular sectors in Malaysia that offer one of the highest exports to Malaysia's economy. This study handles the research study of inventory control for Malaysian palm oil plantation. The existing inventory control cannot be running smoothly when the inventory are managed in different user interface systems which is by utilizing manual inventory control like Microsoft Excel and handwriting documents. Data collection was gathered with the targeted respondents, they are core members of the management team who have a great experience as well as understanding of their inventory system. In order to make PSS inventory control much easier as well as organized, an inventory application system is developed utilizing MS Excel Macro. The outcomes of this research study are a computerized supply control system that beneficial, crucial, and also much better substitute for a hand-operated administration system and quick handling.

INTRODUCTION

In a modest way, the oil palm industry in Malaysia started about more than 100 years ago. In 1917, the oil palm industry was first come into Malaysia at the Tennamaran Estate in Selangor, productivity that put Malaysia's oil palm industry in the foundation for the development. In 2016, the planted area of oil palm had efficiently increased from 5500 ha in the year of 1960 to 5.74 million hectares. Malaysia's oil palm industry had a significantly growth from less than 100 000 ha in 1960 to about 600 000 ha which is about 17.32 million tons in tandem with area expansion [1].

Palm oil production is crucial to Malaysia's economy, which is the second largest producer of commodities in the world after Indonesia. In palm oil plantation, there are several zones which possess a different number of ages of the palm oil trees. The palm oil plants have been replanted in various years. One of the most effective ages of the palm oil plants to make fresh fruit product lots is around 7 to 14 years old. If more variety of grows older, the number of fruits made will decrease years through years. The average elevation of the older palm oil tree is around 12m to 18m. The trees still make fruits, there will certainly be a trouble to gather it. Ranch control possesses no labor force to collect the fruit, there is the method that might get longer opportunity compare to harvest fruit product from prime palm tree. This study focuses on the management of inventories of one of Malaysia's main manufacturing companies, Elaeis Guineensis or known as palm oil. And also, to avoid the misleading data about the current update for the level of inventory by developing an inventory system that reduce the demand under uncertainty.

Inventories are necessary factors for every firm to meet the consumer demands. The inventory control system was used to improve inventory storage capacity and meet customer demand. This research is in cooperation with the palm oil plantation industry in Malaysia. The logic behind this firm selection is systematic inventory control system inefficiency due to uncertain lead time and demand. The company still lacks appropriate forecasting techniques to estimate exact demand for its primary commodities. In palm oil agriculture, there are three types of inventories: palm oil crop, Fresh Fruit Bunch (FFB) and palm oil. The challenge in the palm oil tree is to sustain the amount of the trees, especially on a hot and dry day, according to the weather problem, since the weather can affect FFB's yield, which can also cause high costs. In case If the inventory is unregulated, it will face problems with production to meet customer demand. The big current challenge in palm oil agriculture, however, is palm oil. The uniqueness of the production of palm oil is the production of FFB into two kinds of oils that are crude palm oil (CPO) & palm kernel (PK) which can be used in multiple productions, especially in the production of food and non-food products.

RELATED WORK

Currently, palm oil is the main export products of many countries in the world including Malaysia. It is one of the important products and commodities that share in a lot to Malaysia's economy [2]. According to MPOB, the overall volume of Malaysia's exports is about RM 5 billion of palm oil including its derivatives in Jun 2019 alone. So Malaysia has a total area of 4.5 mil hectare of oil palm plantation which is considered as the second largest oil palm plantation sector in the globe [3]. Alongside of that, a huge quantities of oil palm trunks (OPT), empty fruit bunch (EFB), and oil palm fronds (OPF) are available from replanting and through mill operation and routine field. About 21.63 million cubic

meters (14 million tons) of oil palm trunks would be available within 25 years of rotation of the planting system and 70,000 hectares will be available next year due to replanting [4].

At the beginning of the 2000s, there was a specific attention on palm oil plantation. The major stages and operations were developed by [5] and it can operate in the palm oil sector. To begin with nursery keeping seeds in good condition is a prime element for long-term thrive plantation and the growing seeds will be planted in pre-nursery in three months. Then from 9 to 10 months, it will move to the nursery stage. The cultivated selected material is germinating from the state of being seed to sapling. After that it will move to the stage of planting. The planting stage has two different sizes of plantation. So, the palm oil will go into production after 2 to 3 years of plantation. The average range of lifespan of palm oil is 25 to 30 years. At this range, after 15 years the capacity of the production will reach the maximum production. Follows that the harvest stage, the palm oil production will be removed if the tree reaches to almost 25 feet. In this stage, the possibility of Fresh Fruit Bunch (FFB) could be up to a weight of 25 kg. and the palm oil production will be removed if the height of the tree reaches 25 feet based on the industry limitation weight. Also, this process could become hard and difficult due to the range of 70 to 100 feet of oil tree height. The unbranched palm oil can live up to 200 years, but the applicable lifespan only 22 to 25 years before it goes to replanting process. Around 24 – 48 hours required to get those bunches which have been gathered for processing at the mill. There will be delays that will increase the Free Fatty Acid (FFA) in the FFB which gains many disadvantages for the production such as affecting the worth of the product to be not adequate and suitable for consumers [5].

Inventory control plays an important role in tracking the condition of products at the supply chain level of the delivery of goods from the central warehouse to market in line with customer demand [6]. It contains of stock from raw materials to finished goods that is commonly related to items that are used by the manufacturer on producing their products. With the comprehension of how costly it is, it still useful to the manufacturing companies due to its capability of measuring the process and production efficiency. Systematically, it is able to avoid any financial burden that could possibly occur by the overload inventory or the production disturbing which resulted by the run out of stock [7]. On the other side, the inventory is unstable with clientele's demands, and it will be wasted and may cause avoidable expense. So, inventory control is defined as tracing and tracking process for checking quantities and the location of inventories [8]. Inventories are categorized into three sections which are work in progress in the assembly area, raw material stock in the incoming area and finished goods stock in the outgoing area [9].

Inventory control can be split into four classifications: seasonal inventory, regular inventory, inventory of safety, and speculative inventory. The daily inventory may be calculated on the basis of the quantity of economic order or what is known as Economic Order Quantity (EOQ). The aim of the seasonal inventory is to meet the needs of the raw materials of a given season or production; speculative inventory: The purpose of the strategic inventory is to stop or benefit from inventory losses arising from market volatility; the security inventory (safety) is a buffer inventory prepared for unexpected demand. The common challenge facing domestic businesses is that they always have a large safety inventory. The key to the safety inventory is to consider the awareness of the need for confusion [10].

SYSTEM DEVELOPMENT USING MS EXCEL MACRO

Developing Inventory in Excel

MS Excel is adequate for every industrial or industrial firm to recall the quantity of raw materials and finished products. The firm holds inventory for this reason. Therefore, big companies buy ready-made systems for holding electronic records. For different alternatives today, there are several choices. Which can consider a system by MS Excel macro is good choice to make. The system developed for this research is used in ms excel and recorded by macro in microsoft windows. To develop a system using data of raw materials and finished products which will be sent from the place of authorization, it is required to develop an adequate system that can handle the required needs for the firm. For enterprises, the goods movement that are controlled on their own. For this purpose, companies can use Excel tables. The functional of this tool is quite enough. Any advanced inventory management solution that has been developed internally or bought can only perform effectively if it is subject to the standard guidelines. In the outset, if users ignore these values, then the job will get more complex. So, it is mandatory to develop the excel macro using the EOQ to for inventory level stability and determining the uncertain demand of consumers.

The question of how to unambiguously perform inventory management in Excel is difficult to address. The particulars of a single organization, a factory, and goods need to be taken into consideration. It makes sense to patch them so that the headings of each inventory table do not fly free. This is achieved with the "Freeze Panes" button on the "View" page as in Figure 1.
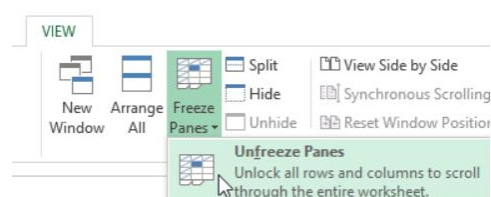

Figure 1: Freeze Penes button

Depending on the number of entries, the user can see the column headers. And do «Providers». Then it is just a matter of developing a table with any shape and length as the place of authorities wish. In this research it is important factor to make the system looks easy to understand and avoid complication specially in this field as in Figure 2.

The system is required to be included in the columns of Stock Inventory Control sheet. The Table in Excel «Economic Order Quantity». Then this is how the warehouse accounting program should work in Excel. We do «EOQ». By decreasing the overall cost per order by setting the first order derivative to zero, the Economic Order Quantity formula is determined. The cost of keeping inventory and the cost of purchasing the inventory are the components of the formula that make up the net cost per order.

Since the product is going to be stocked only for 24 hours, so the holding cost must be very low. Annual quantity (Q) is the pre order volume and it is a variable value so the authorities can adjust it based on their requirements. The cost of ordering (S) depends on the value of the annual quantity divided by the volume per order. The cost of unit is completely variable value, so it depends on the data given from the manufacturing authorities. While the holding cost is related to the carrying cost multiplied by the cost of unit. So it is based on this logic to operate the calculation for the Economic Order Quantity and to get the logical demand under the uncertainty conditions.
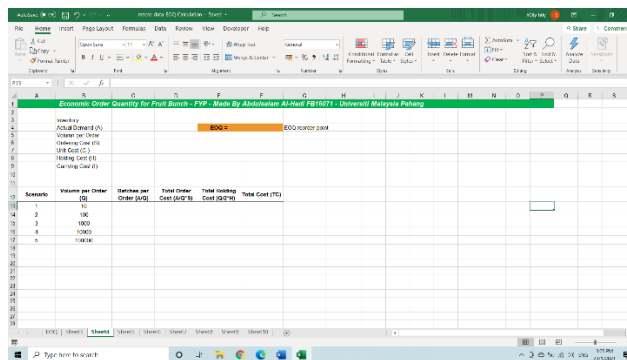

Figure 2: Inventory Control System

Recording Macro in Excel

As we have already the structural shape table of the inventory to determine the level of uncertain demand. It is required to program a macro to record the steps. It can save every step that users perform in Excel for future requirements. Actually, the main function of macro is to record automatic certain tasks if the user has repeated tasks in Microsoft Excel. A macro is an operation that can run as many times as the user wants or in another way it is a series of actions. The user can log the mouse clicks and keystrokes while creating a macro. Also, user can edit it after creating a macro and allow small improvements to the way it functions. At the beginning users must make sure whether the tab for Developer is there or not because in some cases it will not appear automatically, refer Figure 3. To record a macro, it is necessary to click the Record Macro in the Code category on the Developer page. Preferably, in the Macro name box, enter a name for the macro, enter a shortcut key in the Shortcut key box, and enter a description in the Description box, and then click OK to start recording. Then achieve the desired results that is intended to automate, such as entering text from the boilerplate, or filling in a data column.

On the Developer tab, there is a Stop Recording button so the user after recording macro can click it to stop the recording. And the system of Excel will record the exact steps that was clicked by user. To display macros associated with a workbook, select Macros on the Developer page. Or the Alt+ F8 press. The Macro dialogue box opens this way. Users usually take in consideration that it is not possible to undo Macros. Before running the recorded macro for the first time, they make sure that they have either saved the workbook where they want to run the macro, or, better yet, they are working on a copy of the workbook to prevent any unwanted changes. users will close the workbook without saving it if they are running a macro and it does not do what they want.
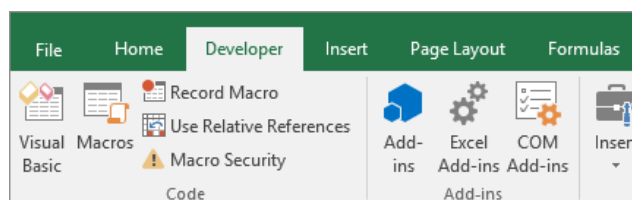

Figure 3: Developer tab in Excel Macro

SYSTEM ANALYSIS USING MS EXCEL MACRO

As shown in Figure 4, the result of Economic Order Quantity value is for uncertain demand and reorder point. Which shows the total cost of all the expenses that the firm will lose for the inventory.
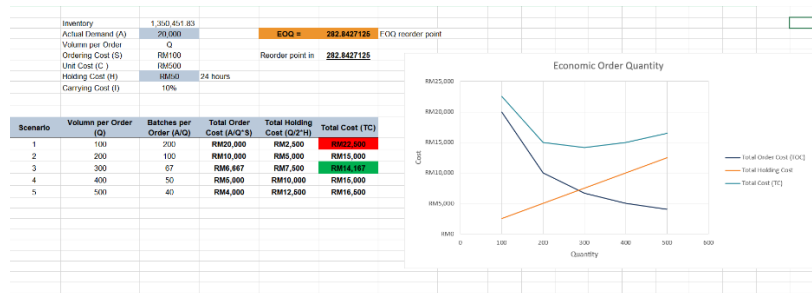
Figure 4: Economic Order Quantity Value Based for Uncertain Demand

The collected data of inventory has a value of 1,350,451.83 of Fruit Bunch based on the palm oil firm. The Actual Demand, Volumn per Order, Ordering Cost, Unit Cost, and Carrying Cost are variables, and their values depend on the firm, firm's own regulations, and management method they usually use. Once those values are inserted in their specific location in the system. Excel macro is programmed to calculate the values of the following: Holding Cost, Batch Per Order, Total Order Cost, Total Holding Cost, Overall Cost, and the value of the Economic Order Quantity with indicating the lowest value of the total cost for all the scenarios to highlight it with a green color as a preferred one. The Volumn per Order of highlighted green value of Total Cost has the almost the same value as the Economic Order Quantity which shows that is the suitable demand under uncertain conditions.

Inventory	1,350,451.83				
Actual Demand (A)	20,000		EOQ =	282.8427125	E
Volumn per Order	Q				
Ordering Cost (S)	RM100		Reorder point in	282.8427125	
Unit Cost (C)	RM500				
Holding Cost (H)	RM50	24 hours			
Carrying Cost (I)	10%				

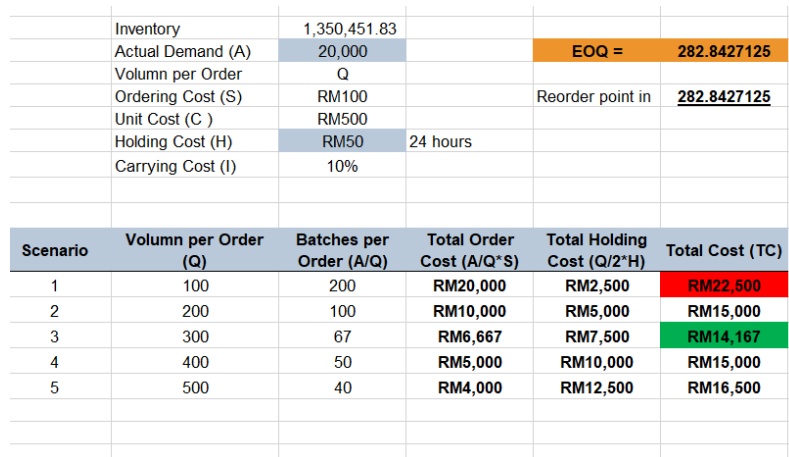| Scenario	Volumn per Order (Q)	Batches per Order (A/Q)	Total Order Cost (A/Q*S)	Total Holding Cost (Q/2*H)	Total Cost (TC)
1	100	200	RM20,000	RM2,500	RM22,500
2	200	100	RM10,000	RM5,000	RM15,000
3	300	67	RM6,667	RM7,500	RM14,167
4	400	50	RM5,000	RM10,000	RM15,000
5	500	40	RM4,000	RM12,500	RM16,500

Figure 5: System Calculation Case 1

As shown in Figure 5, the recorded macro is run, the system calculated the value of EOQ. Based the values inserted, the value of the EOQ is 282.8427125 which is almost indicating the closest value of the volume per order of the third scenario to show that is the required demand under the uncertain conditions. The system is working to get the exact value for the EOQ as the lowest Total Cost of the Volumn per Order. In some cases, if it does not get the same value, the system will indicate the closest value of Volumn per Order to the EOQ.

In another case with different values were run in the macro system, as shown in Figure 6, the system is selecting the lowest the value of the total cost as the value of the volumn per order which is the same amount of EOQ. Based on this method the firms can know the demand in uncertain conditions based on the value of EOQ. And based on the value of EOQ, users can determine the need of volumn required per order as it is the demand under uncertain circumstances. The red highlighted value is showing the highest Total Cost.

Inventory	1,350,451.83				
Actual Demand (A)	320		EOQ =	50.59644256	E
Volumn per Order	Q				
Ordering Cost (S)	RM20		Reorder point in	50.59644256	
Unit Cost (C)	RM50				
Holding Cost (H)	RM5	24 hours			
Carrying Cost (I)	10%				

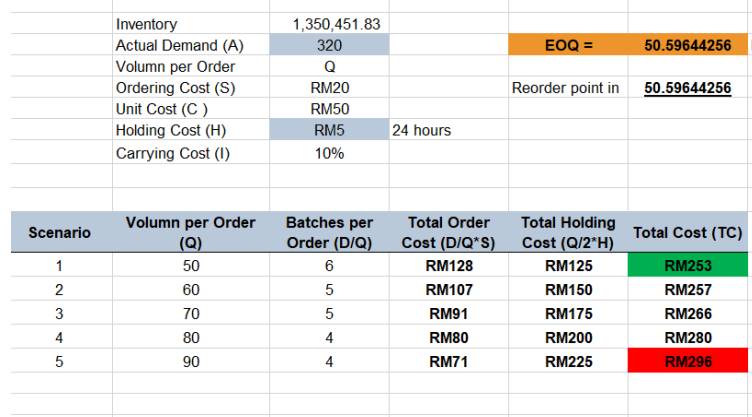| Scenario	Volumn per Order (Q)	Batches per Order (D/Q)	Total Order Cost (D/Q*S)	Total Holding Cost (Q/2*H)	Total Cost (TC)
1	50	6	RM128	RM125	RM253
2	60	5	RM107	RM150	RM257
3	70	5	RM91	RM175	RM266
4	80	4	RM80	RM200	RM280
5	90	4	RM71	RM225	RM296

Figure 6: System Calculation Case 2

The values in the examined case are small amounts compared to the industry values. The reason behind that is to make the concept clear for the readers and researchers in the future. And the same methodology can be obtained to more complex cases and the results will be almost the same. Determining the demand in difficult situations as the uncertain demand, the inventory can be ready to satisfy consumers demand and avoid losing them in the future. The macro is programmed to be working in this logic.

CONCLUSION

In conclusion, Excel macro is just a method of modelling mathematical formula and uses it for repeated future tasks. While there are other methods can be used for inventory control improvements in the future of palm oil industry. Particularly in the palm oil industry, the inventory control system using Excel Macro in inventory management is important, and the main objective of the inventory control system is to control the product and service in order to increase quality and productivity to satisfy customer and consumer demands. Manufacturing firms should introduce new techniques to improve inventory productivity from inventory management risk as plans to resolve difficulties and obstacles that can arise in the control of palm oil inventory.

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