APPLICATION OF POULTRY DEMAND FORECASTING TECHNIQUE FOR TRANSPORT COST MANAGEMENT.

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ABSTRACT

Poultry breeding retail and wholesale business had met customers' expectations. There was no provision for advance production and order some sensons had large quantity of customer orders, and some suppliers could not produce the goods to meet the customers' needs in time. This was lost opportunity. Transport costs were also increased since the delivery sizes were small. In other times, the production was higher than order demand. Hence the inventory cost was increased. To solve this problem, a forecasting technique was applied to forecast the demand and plan poulity production to manage transport cost.

The result shows that the moving-average forecasting technique was close to the real sales and it devide 4 periods of Egg-laying duckling. In July 2019, the poulity demand forecasting was 138 UNIT. The lowest MAPE was 23.81 percent, the EOQ of Egg-laying duckling was 47 per time. This would decrease the cost by 36 percent. The ROP was 18. Young egg-laying duck. In July, the poulity demand forecasting was 138, and the lowest MAPE was 31.64 percent. the EOQ of Young egg-laying duck was 34 per time, the cost was decreased for 6 percent, the ROP of was 10. Muscovy duckling. In July 2019, the poulity demand forecasting was 129,the lowest MAPE was 22.92 percent. the EOQ of Muscovy duckling was 45 per time, the cost was decreased for 33 percent, the ROP of was 17. Egg-laying chick. In July, the poulity demand forecasting was 107 and the lowest MAPE was 6.13 percent., the EOQ of Egg-laying chick was 42 per time, the cost was decreased for 26 percent, the ROP was 14. There are 3 periods of Quail of Moving average in July 2019, the poulity demand forecasting was 300, and the lowest MAPE was 16.56 percent. the EOQ was 77 per time, the cost was decreased for 60 percent and the ROP was 48. Finally the poultry farm found the information of forecasting the tolerance reduce as 28.66% by averaging.

The forecasting implementation was effective. However, other forecasting models should be studied and evaluated before actual selection and implementation. This could be executive's approach to consider in a businesss to increase efficiency and decrease transport costs.

Keyword : Forecasting, Deviation, Transport cost

INTRODUCTION

Current economic Pet products and services industry has well performed continually and trend to expansion in the future runs along with the economic recovery. Chairat Farm started its business based on personal preferences in the past by starting from breeding beautiful birds for sale. After that, beautiful broilers were introduced to sell and find sales channels by establishing a shop in Chatuchak Park, a beautiful poultry zone. And expanded the business by bringing 32 kinds of beautiful poultry to breed for retail and wholesale; Chairat Farm was well accepted to customers. There was no provision for advance production and order some

seasons had large quantity of customer orders, and some suppliers could not produce the goods to meet the customers' needs in time. This was lost opportunity. Transport costs were also increased since the delivery sizes were small. In other times, the production was higher than order demand. Hence the inventory cost was increased. To solve this problem, a forecasting technique was applied to forecast the demand and plan poultry production to manage transport cost.

OBJECTIVE

To study inventory forecasting model of poulitry demand production.

To plan and reduce the risk of raw material according with needs and manage transport cost

LITERATURE REVIEW

The researcher defined the terminology in accordance with variable definition. Forecasting means the process of making predictions of the future based on past and present data and most commonly by analysis of trends. Economic Order Quantity means the optimum quantity of an item to be purchased at one time in order to minimize the combined annual costs of ordering and carrying the item in inventory. Reorder Point means the level of inventory which triggers an action to replenish that inventory stock.

1. Forecasting techniques, Moving average method is forecasting techniques which using the past information to forecast the future like predict the demand of product using to plan in the future purchasing in the future from the amount of using product in the past by Chawaree (2556) said,(Simple Moving Average :SMA) this method will balance the weight of all calculated values to be equally significant by using the time established information and make the average. The moving average is the averaging method when have no trend or have a little. The method is very useful when we can assume that the marketing demand is stable all the time and use equation as

$$\text{Moving Average} = \frac{\text{Demand in previous n periods}}{n}$$

The n is the period amount in moving average like 3,4,5 months continueingly

2. Exponential Method is the averaging of weight balance and the value of calculated forecast which calculated from the forecast value before and plus the difference percent between forecast value and real value of serie at that point which is the next period

forecast value = The forecast value before + α (real value-the forecast value of the period before)

by (The real forecast value -The forecast value of the period before) Instead of the mistake in the forecast and α is the percentage of forecast's mistake thus

Exponential = $F_t = F_{t-1} + \alpha (A_{t-1} - F_{t-1})$

by F_t = forecast value for t period

F_{t-1} = forecast value for t-1 period

α = Smoothing constant

A_{t-1} = demand of the real sales volume for t-1 period

3. Forecasting Correctness Analyze : the accuracy in forecasting is the important thing and have a significance in two kinds to be considered which is the tolerance of forecasting which happened in the past, The ability of forecasting result which can be

respond with changing to analyze. The measuring method the error of forecasting the past information which to be used generally and it has 2 methods thus mean absolute deviations: MAD and mean squared error :MSE The error finding that use for comparing with forecasting value by MAD(Mean Absolute Deviation)method From formula

$$MAD = \frac{(\Sigma|\text{real value} - \text{forecast value}|)}{N}$$

The finding method of mean squared error value to use for comparing with forecasting value by using MSE method(Mean Squared Error) From formula

$$MSE = \frac{(\Sigma I\text{real value} - \text{forecast value})2}{N}$$

The error finding that means how many percent of error that can happen in forecasting to use in the conclusion to prove that prediction have the correctness enough.

4. Having inventory to supply suitable amount of product can be reducing the risk from demand and supply variation by Pimnisa Dechkarnchanasil said the inventory is products that we manufactured or bought for distribute. The inventory management is the important thing to service customers to have the product that they want to buy all the time they need. On the other hand it can lead the high cost in an operation thus many organizations realized this kind of problems and find the solving problem method to reduce the inventory cost in supply chain system, the effectiveness of inventory can balance the product level with customer's satisfy such as order fill rates. However the risk that happen from inventory management might be the overload of product stocking and the stocked product is not the one that customers need.Nukrak (2551) researched in the thesis about the suitable amount of purchasing to reduce the expense of dynamic flow line company limited inventory management. It is the Cast Steel Value import business which found that it had too much stock that cost the budget of purchasing and expenseof inventory more than necessary also without purchasing amount calculation method.Nukrak's research had the objective to find the suitable amount of purchasing to reduce the expense from product collection and decrease the product stock amount. Kraiwit (2017).Hence, this study use Continuous Review System policy (s, Q*) in order to compare the cost to that from the current situation

5. Purchasing means the operating activity to bring in products or service ,raw material along with machine, equipment to achieve the business's objective. Normally in business can divide the purchasing into two category by purchasing to sell and purchasing to use or transform this protocol is very important especially in the generation which every environment change so rapidly ,the competition to reduce product's cost and operation cost, Staff and purchasing responsible unit have to realize how to develop job task and job protocol to connect with another unit in an organization and to connect with business supply chain in effective way and can be response with needs in the right way and right time.

METHODOLOGY

Population and sample groups

This research applied forecasting technique of poultry demand for managing transport cost by using average of last one year and three months previous sales. The population of this research is the case study chose to use the data need in group poulity production and it devide 5 periods of Egg-laying duckling ,Young egg-laying duck ,Muscovy duckling ,Egg-

laying chick and Quail previously one year and three months to be predicted as navigable product for forecasting by assume selling volume in the future from manufactured volume in the past ,Forecasting data and collected related data to make comparison of historical data.

The sample group is calculated by forcasting techniques (Moving Average) 3 periods and 4 periods compare with (Exponential) which using past information forecasting techniques. Finding the Economic Order Quantity cost reduction and new Reorder Point.

Table 1: The example of using Microsoft Excel to calculate

	month	Egg-laying duckling (UNIT)	mov3	mov4	Exponential		MAPE MOV3	MAPE MOV4	MAPE 0.1	MAPE 0.5
					0.1	0.5				
	April	160			160	160			0.00	0.00
	May	120			160.00	160.00			33.33	33.33
	June	110			156.00	140.00			41.82	27.27
	July	80	130		151.40	125.00	62.5		89.25	56.25
2018	August	90	103.33	117.5	144.26	102.50	14.81	30.56	60.29	13.89
	September	130	93.33	100	138.83	96.25	28.21	23.08	6.80	25.96
	October	150	100	102.5	137.95	113.13	33.33	31.67	8.03	24.58
	November	160	123.33	112.5	139.16	131.56	22.92	29.69	13.03	17.77
	December	200	146.67	132.5	141.24	145.78	26.67	33.75	29.38	27.11
	January	220	170	160	147.12	172.89	22.73	27.27	33.13	21.41
	February	210	193.33	182.5	154.40	196.45	7.94	13.10	26.47	6.45
	March	180	210	197.5	159.96	203.22	16.67	9.72	11.13	12.90
2019	April	150	203.33	202.5	161.97	191.61	35.55	35.00	7.98	27.74
	May	100	180	190	160.77	170.81	80.00	90.00	60.77	70.81
	June	120	143.33	160	154.69	135.40	19.44	33.33	28.91	12.84
	July		123.33	137.5	151.22	127.70	370.76	357.16	450.32	378.32

Table 2: The example of using Microsoft Excel to calculate the Economic Order Quantity cost reduction.
and new Reorder Point.

Poultry	Demand	(S)	(H)	EOQ	ROP	s*d	h*q
Egg-laying duckling,	2,180	0.26	0.51	47	18	567	24.04
Young egg-laying duck	1,140	0.26	0.51	34	10	296	17.39
Muscovy duckling	2,000	0.26	0.51	45	17	520	23.03
Egg-laying chick	1,690	0.26	0.51	42	14	439	21.17
Quail	5,780	0.26	0.51	77	48	1,503	39.15
						./Q	./2

The research tools

This research applied forecasting technique of poultry demand for managing transport cost by using average of last one year and three months previous sales. Time series consist of Exponential Smoothing Meth forecasting and Moving Average forecasting. Finding the Economic Order Quantity cost reduction. Finding a new Reorder Point. Use Microsoft Excel 2013 to make mathematic model shown about forecasting data of forecasting in table 3.

Table 3: Data about manufactured volume conclusion

	month	Egg-laying duckling (UNIT)	Young egg-laying duck(UNIT)	Muscovy duckling(UNIT)	Egg-laying chick(UNIT)	Quail (UNIT)
2018	April	160	80	120	100	300
	May	120	60	100	110	300
	June	110	40	95	105	320
	July	80	35	80	120	300
	August	90	50	130	125	400
	September	130	55	140	100	400
	October	150	60	150	120	400
	November	160	70	160	120	410
	December	200	90	130	115	500
2019	January	220	120	180	120	500
	February	210	110	200	130	500
	March	180	160	190	105	550
	April	150	130	130	100	300
	May	100	140	110	111	300
	June	120	120	85	110	300
	July					

The result shows that the moving-average forecasting technique was close to the real sales and it devide 4 periods of Egg-laying duckling. In July 2019, the poulity demand forecasting was 138 UNIT. The lowest MAPE was 23.81 percent, the EOQ of Egg-laying duckling was 47 per time. This would decrease the cost by 36 percent. The ROP was 18.

Table 4: Forecasting Egg-laying duckling compare with moving average 3periods and 4 periods

	month	Egg-laying duckling (UNIT)	mov3	mov4
2018	April	160		
	May	120		
	June	110		
	July	80	130	
	August	90	103.33	117.5
	September	130	93.33	100
	October	150	100	102.5
	November	160	123.33	112.5
	December	200	146.67	132.5
2019	January	220	170	160
	February	210	193.33	182.5
	March	180	210	197.5
	April	150	203.33	202.5
	May	100	180	190
	June	120	143.33	160
	July		123.33	137.5

Poultry	Demand	(S)	(H)	EOQ	ROP
Egg-laying duckling,	2,180	0.26	0.51	47	18

Young egg-laying duck. In July, the poulity demand forecasting was 138, and the lowest MAPE was 31.64 percent. the EOQ of Young egg-laying duck was 34 per time, the cost was decreased for 6 percent, the ROP of was 10.

Table 5: Forecasting Young egg-laying duck compare with moving average 3periods and 4 periods

	month	Young egg-laying duck(UNIT)	mov3	mov4
2018	April	80		
	May	60		
	June	40		
	July	35	60	
	August	50	45	53.75
	September	55	41.67	46.25
	October	60	46.67	45
	November	70	55	50
	December	90	61.67	58.75
2019	January	120	73.33	68.75
	February	110	93.33	85
	March	160	106.67	97.5
	April	130	130	120
	May	140	133.33	130
	June	120	143.33	135
	July		130	137.5

Poultry	Demand	(S)	(H)	EOQ	ROP
Young egg-laying duck	1,140	0.26	0.51	34	10

Muscovy duckling. In July 2019, the poulity demand forecasting was 129, the lowest MAPE was 22.92 percent. the EOQ of Muscovy duckling was 45 per time, the cost was decreased for 33 percent, the ROP of was 17.

Table 6: Forecasting Muscovy duckling compare with moving average 3periods and 4 periods

	month	Muscovy duckling(UNIT)	mov3	mov4
2018	April	120		
	May	100		
	June	95		
	July	80	105	
	August	130	91.67	98.75
	September	140	101.67	101.25
	October	150	116.67	111.25
	November	160	140	125
	December	130	150	145
2019	January	180	146.67	145
	February	200	156.67	155
	March	190	170	167.5
	April	130	190	175
	May	110	173.33	175
	June	85	143.33	157.5
	July		108.33	128.75

Poultry	Demand	(S)	(H)	EOQ	ROP
Muscovy duckling	2,000	0.26	0.51	45	17

Egg-laying chick. In July, the poulity demand forecasting was 107 and the lowest MAPE was 6.13 percent., the EOQ of Egg-laying chick was 42 per time, the cost was decreased for 26 percent, the ROP was 8.

Table 7: Forecasting Egg-laying chick compare with moving average 3periods and 4 periods

	month	Egg-laying chick(UNIT)	mov3	mov4
2018	April	100		
	May	110		
	June	105		
	July	120	105	
	August	125	111.67	108.75
	September	100	116.67	115
	October	120	115	112.5
	November	120	115	116.25
	December	115	113.33	116.25
2019	January	120	118.33	113.75
	February	130	118.33	118.75
	March	105	121.67	121.25
	April	100	118.33	117.5
	May	111	111.67	113.75
	June	110	105.33	111.5
	July		107	106.5

Poultry	Demand	(S)	(H)	EOQ	ROP
Egg-laying chick	1,690	0.26	0.51	42	14

There are 3 periods of Quail of Moving average in July 2019, the poulity demand forecasting was 300, and the lowest MAPE was 16.56 percent. the EOQ was 77 per time, the cost was decreased for 60 percent and the ROP was 30.

Table 8: Forecasting Quail compare with moving average 3periods and 4 periods

	month	Quail (UNIT)	mov3	mov4
2018	April	300		
	May	300		
	June	320		
	July	300	306.67	
	August	400	306.67	305
	September	400	340	330
	October	400	366.67	355
	November	410	400	375
	December	500	403.33	402.5
2019	January	500	436.67	427.5
	February	500	470	452.5
	March	550	500	477.5
	April	300	516.67	512.5
	May	300	450	462.5
	June	300	383.33	412.5
	July		300	362.5

Poultry	Demand	(S)	(H)	EOQ	ROP
Quail	5,780	0.26	0.51	77	48

RESULTS

The research was to interview and collect data using for forecasting model by Time series analysis. Exponential Smoothing method was applied and compared with Moving Average method. And the result was next to forecasted the Economic Order Quantity cost reduction and a new Reorder Point in order to find the lowest and most suitable purchasing by means of collecting sales statistics for fifteen months between March 2018 to July 2019.

The population of this research is the case study chose to use the data need in group poulity production

and it devide 4 periods of Egg-laying duckling ,Young egg-laying duck ,Muscovy duckling ,Egg-laying chick and Quail previously one year and three months.The result shows that the moving-average forecasting technique was close to the real sales and it devide 4 periods of Egg-laying duckling. In July 2019, the poulity demand forecasting was 138 UNIT. The lowest MAPE was 23.81 percent, the EOQ of Egg-laying duckling was 47 per time. This would decrease the cost by 36 percent. The ROP was 18. Young egg-laying duck. In July, the poulity demand forecasting was 138, and the lowest MAPE was 31.64 percent. the EOQ of Young egg-laying duck was 34 per time, the cost was decreased for 6 percent, the ROP of was 10. Muscovy duckling. In July 2019, the poulity demand forecasting was 129,the lowest MAPE was 22.92 percent. the EOQ of Muscovy duckling was 45 per time, the cost was decreased for 33 percent, the ROP of was 17. Egg-laying chick. In July, the poulity demand forecasting was 107 and the lowest MAPE was 6.13 percent., the EOQ of Egg-laying chick was 42 per time, the cost was decreased for 26 percent, the ROP was 14. There are 3 periods of Quail of Moving average in July 2019, the poulity demand forecasting was 300, and the lowest MAPE was 16.56 percent. the EOQ was 77 per time, the cost was decreased for 60 percent and the ROP was 48. Finally the poultry farm found the information of forecasting the tolerance reduce as 28.66% by averaging.

Table 9: Present the result of error forecasting value

Amount Indicator Navigable product	**Jul-19**			**Forecasting Value 2019**
	planed	**real used**	**forecast**	
Egg-laying duckling	180	130	138	reduced error as 23.33%
Egg-laying duckling	150	90	93	reduced error as 38.00%
Muscovy duckling	180	125	129	reduced error as 28.33%
Egg-laying chick	150	110	107	reduced error as 28.66%
Quail	400	320	300	reduced error as 25.00%
The holding inventory amount reduced As 28.66% by average				

If we use the pattern as explain before, It can help a company to decrease of forecasting error as 28.66 by average. And the number of value which receive from math model shown that the using amount is nearly with the real use amount and can be used for considered data, planning the navigable product and planning for suitable job of company as study case. The forecasting implementation was effective. However, other forecasting models should be studied and evaluated before actual selection and implementation. This could be executive's approach to consider in a business to increase efficiency and decrease transport costs.

CONCLUSION AND FUTURE WORK

The idea about reduce the forecast deviation guideline establishment by researcher did the experiment of using moving average method compared with exponential method to test the forecast value as figure 1.

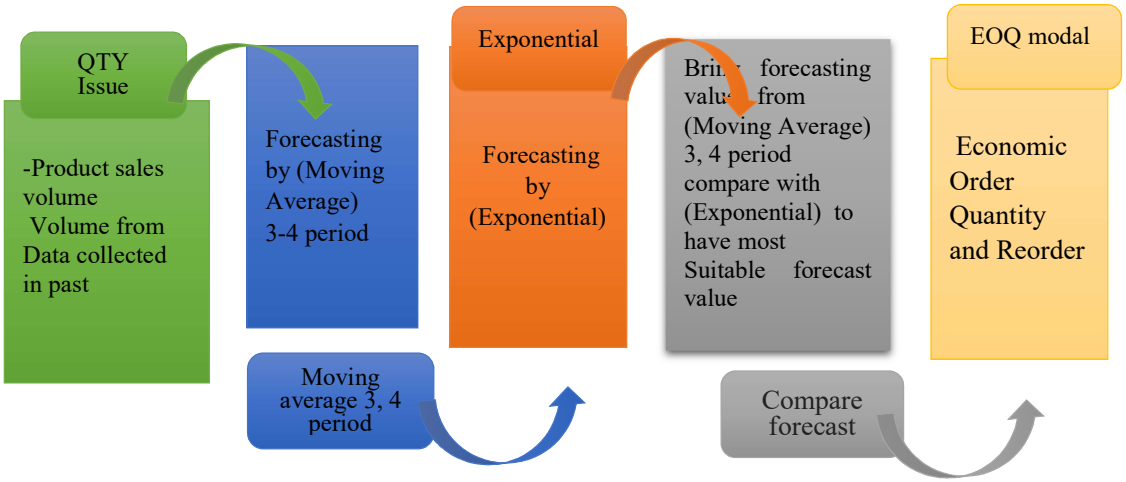

Figure 1. Conceptual framework for experimental forecast

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REFERENCE

[1] Kraiwit Sinthukhammoon. (2017).The Analysis of Procurement and Inventory Policy: Steel Tank Firm. Full Paper Proceeding Book 8th International conference on Implications of Research in Business, Economics, Management Social Sciences and Humanities (IRBEMSH).Osaka, Japan

[2] Wittaya Suharuedamrong(2546). Logistics and Supply chain can be explained easily.Bangkok : SE-ED ucation.,2546. Chawalee Rattanawongsri “the advance forecasting of rubber in agriculture marketing Thailand” Veridian E-Journal, SU Vol.6 No.1.,2554.

[3] Wichai Rungreunganan.(2550). Inventory Management.Bangkok:Thailand Industry council.,2550.Information System in inventory and stock.Available: http://kilerk.blogspot.com/2008/07/blog-post.html

[4] Pipop Lalitaporn.(2549).Planning system and production control(revised)published 13th.Bangkok :Technology Promotion Association(Thailand-Japan).,2549.

[5] Mukda Maanmin.(2549).Time series and forecasting.Bangkok:Four Printing.,2549

[6] Somkeard Kate-aem.(2548).Forecasting Technique.(published 2nd).Songkla:Taksin University.,2548
[7] Thanakorn Jinda Banjerd.(2554).”Increasing the efficiency in inventory management”Por ka la auto co.,LTD., University of the Thai Chamber.,2554
[8] Benjapha Suwanprateep and Chana Yeangkamonsing,’’Education for strategy establishment of inventory managing to be in suitable amount in case study of company C Electric distributor
[9] T. Hong, P. Wang, L. White, "Weather station selection for electric load forecasting", International Journal of Forecasting, vol. 31, no. 2, pp. 286-295.,2015.
[10] R. J. Hyndman, G. Athanasopoulos, Forecasting: principles and practice, OTexts.,2014
[11] Stevenson, W.J.Production Operations Management 8th Edition Irwin/McGRAW-HILL.,2005
[12] P.Khaemusunun,(2009), Forecasting Thai Gold Prices. Available from: http://www.wbiconpro.com/3-Pravit-.pdf.,2009
[13] Dobler, Donald W. Lee, Lamar. Burt, David (1984) Industrial procurement Purchasing Materials management McGraw-Hill, New York.,1984
[14] Massarrat, A.K. (2013),"Forecasting of gold prices (box Jenkins approach)".International Journal of Emerging