DEMAND FORECASTING OF OKRA: CASE STUDY OF OKRA PLANTING COMMUNITY ENTERPRISE OF KAMPHAENG SAEN DISTRICT

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ABSTRACT

Abstract—The objective of this research was analyzing the data of demand to propose a demand forecasting plan approach of Okra Planting Community Enterprise of Kamphaeng Saen District. Method was studying the weekly demand data to analyze the characteristics and make a forecast with Exponential Smoothing with Trend Adjustment method and Seasonal Variations method. After obtaining the forecast values of both methods, then measure the error with the method to find the method of forecasting which has the least error. The results showed that demand forecasting with Seasonal Variations method has lesser error than the Exponential Smoothing with Trend Adjustment method. Therefore, a method of Demand Forecasting of Okra with the Seasonal Variations method was chosen as a forecasting method to be used to forecast the next month's data. To find the possibility to prepare the area for cultivation of okra to reduce wastage or waste of production without benefit.

Keywords—Forecasting, Okra, Community Enterprise.

INTRODUCTION

Okra is a perennial vegetable that is about 1 year old with a stem height of 40 cm to 200 cm. It grows well in subtropical climates and has high nutrition and has medicinal properties. Okra planted areas in the central region such as Suphanburi 1,816 rai, Ratchaburi 547 rai, Nakhon Pathom 357 rai, Kanchanaburi 189 rai, Ang Thong 122 rai, Chachoengsao 99 rai, Samut Sakhon 50 rai, and Prachinburi 35 rai. These are okra planting areas for both domestic and international exports.

Okra is an important agricultural crop. And there are a lot of exports, especially Japan, which imports a lot of okra. It is also an important trading partner that has negotiated to bring okra from Thailand to the Japanese market because it is a nutritious vegetable. It can treat blood pressure, nourish the brain, reduce stomach ailments, and has antiparasitic substances, which have shown properties in traditional medicine textbooks and modern medicine experiments, both domestically and internationally.

Okra Planting Community Enterprise of Kamphaeng Saen District is a source of okra cultivation for both domestic and international exports. There will be a middleman who will deliver the okra seeds and determine the production plan for Okra Planting Community Enterprise of Kamphaeng Saen District. There will be a selection criterion for okra that the middleman sends representatives to strictly inspect the standard and make agreements with community groups on the production of products free from chemicals, residues, and production selection criteria. Over a period of 2 to 3 years, the amount of demand decreases, resulting in a decrease in the number of production orders, which affects the farmer's income.

In the most industries business is critical competitive that made them create strategies to be advantage competitive. The important strategy is using in many firms are focus on maintain quality of products and services, price, reduce cost, meet customers need and satisfy customers. Thus, increase to meet customers' needs in organization is one procedure to support capacities in market competition. Many organizations concentrate on

build to increase satisfaction strategy in management which is best process to increase satisfaction in demand forecasting operations.

Due to the decreasing sales volume and unstable sales volume and in each order of production which affects the preparation of farmers for okra planting. Therefore, the researcher must study the volume forecast of okra sales to find a suitable forecasting method.

The objectives are to study the sales volume of okra, to analyze data on the amount of okra sales, and to propose a plan for forecasting demand

LITERATURE REVIEWS

1) Demand Forecasting

Demand Forecasting in Logistics and Supply Chain Management involves demand forecasting, purchasing processes, production planning processes, warehousing processes, and shipping and distribution, which Details are as follows: The first important management process is forecasting customer needs. Forecasting is an estimation of the customer's product demand in advance using systematic and accurate forecasting methods and techniques. Demand forecasting is a method of forecasting that uses historical data to predict future demand from customers using a variety of forecasting methods.

There are three main forecasting techniques:

1. Qualitative forecasting techniques (Qualitative)
2. Quantitative forecasting techniques (Quantitative)
3. Forecasting techniques using a causal model

2) Exponential Smoothing with Trend

Also known as Double Smoothing, it is used in cases where demand data tends to increase or decrease. Unlike the exponential smoothed method, which is suitable for relatively stable demand data. The forecasting equation of Exponential Smoothing with Trend has the following form:

$$FIT_t = F_t + T_t$$

$$F_t = \alpha(A_t\text{-}1) + (1\text{-}\alpha)(F_{t-1} + T_{t-1})$$

$$T_t = \beta(F_t - F_{t-1}) + (1\text{-}\beta)\, Tt_{-1}$$

Ref. FIT_t = Forecasting the trending demand at time t

F_t = Smoothed exponential demand at time t

T_t = best estimate of trend at time t

A_t = Actual data at time t

α = smoothing factor of data; $0 < \alpha < 1$

β = trend smoothing factor; $0 < \beta < 1$

3) Seasonal Variations

Seasonal Variations refers to seasonal changes occurring repeatedly over the course of a year until they become uniform. There are steps as follows:

1. find the average demand in each season
2. Find the mean of every season (find the total mean of all data).
3. Find the seasonal index average.
4. Estimated annual demand for next year.
5. Take the value obtained in step 4, divide by the number of seasons and multiply by the value in step 3.

4) Mean Absolute Deviation (MAD)

Error finding for comparing the forecast values of each model which cannot say that the forecast value is good but can only tell which forecast has a much smaller error. Mean Absolute Deviation has the following form:

$$MAD = \frac{\Sigma|\text{Actual} - \text{Forecast}|}{\text{n}}$$

METHODS

1) Collecting Okra demand data

The researcher collects data on Okra demand data during September to December 2021 of Okra Planting Community Enterprise of Kamphaeng Saen District.

2) Analyze the characteristics of demand quantity data

Analysis of Okra demand data during September to December 2021, all data were divided into all weekly data and all data were analyzed in the form of graphs for further data analysis.

3) Demand forecasting

The researcher forecasted demand for okra by selecting a forecasting method suitable for seasonality or trend data. Therefore, two forecasting methods were selected: Exponential Smoothing with Trend and Seasonal Variations.

4) Measurement error of the forecast

Finding the error for comparing the forecast values of each model by using Mean Absolute Deviation (MAD) to find the error.

5) Compare forecast values

Bring the measurement error of both forecasting methods to compare the forecast values. Determine the minimum deviation of the forecasting method and use that forecasting method in demand planning.

RESULTS

1) Demand data characteristics

When the demand data was analyzed in graph form, it was found that the data tended to fluctuate seasonally. After that, the researcher has searched for a trendline and found that during the 4-month period, the number of products purchased tends to decrease following as figure 1:

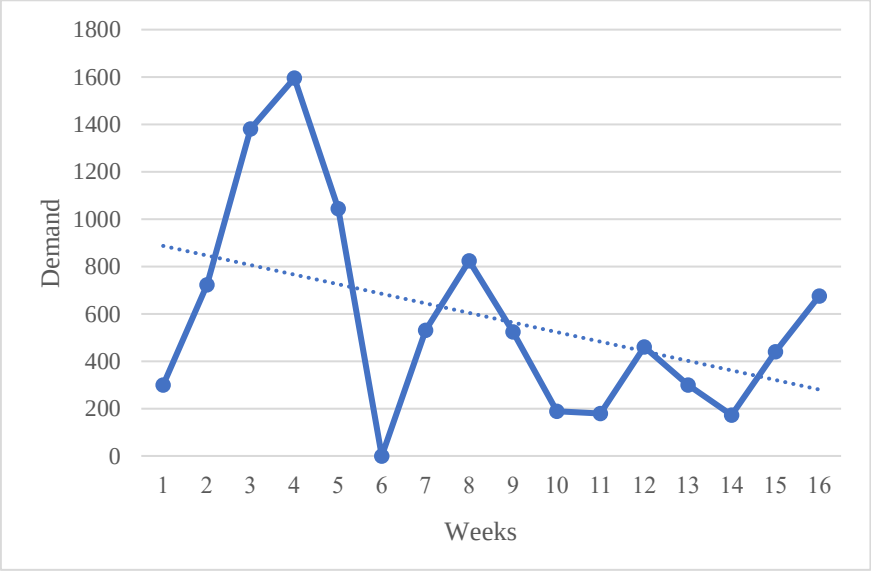

Figure 1: Demand of Okra

From the figure, the demand data fluctuates seasonally. The researcher has found a trend line that the demand data is lower than the number of raises purchased. In which the researcher has collected all the data that has been used to come up with a forecast value.

2) Demand Forecasting data

The researcher used the collected data to determine the forecast value by using 2 forecasting methods: Exponential Smoothing with Trend Adjustment method and Seasonal Variations, for demand forecasting

September to December. After obtaining the forecast values for all 4 months, the forecasting method was then applied in the forecasting of January, showing the data as shown in the following table.

Table 1 Demand forecast of Exponential Smoothing with Trend Adjustment and Seasonal Variations

Method	January 2022	Demand Forecast
Exponential Smoothing Trend Adjustment	Week 1	301.00
	Week 2	301.00
	Week 3	301.00
	Week 4	301.00
Seasonal Variations	Week 1	541.98
	Week 2	271.00
	Week 3	632.48
	Week 4	888.73

From the table 1, it was found that the Exponential Smoothing Trend Adjustment method yielded a weekly forecast value of 301, while the Seasonal Variations method yielded a forecast value of 541.98, 271.00, 632.48, and 888.73, respectively.

3) Result of measurement error

Take all 2 data forecast values to measure the deviation by Mean Absolute Deviation (MAD) and find the absolute value as shown in Tables 2 and 3.

Table 2 Mean Absolute Deviation (MAD) by Exponential Smoothing with Trend Adjustment method

January	Demand	Demand Forecast	Error
Week 1	379.8	301.00	78.80
Week 2	582.6	301.00	281.60
Week 3	1064.8	301.00	763.80
Week 4	2164.8	301.00	1863.80
		MAD	747.00

Table 3 Mean Absolute Deviation (MAD) by Seasonal Variations method

January	Demand	Demand Forecast	Error
Week 1	379.8	541.98	162.18
Week 2	582.6	271.00	311.60
Week 3	1064.8	632.48	432.33
Week 4	2164.8	888.73	1,276.07
		MAD	545.54

From Mean Absolute Deviation (MAD), it was found that the Exponential Smoothing with Trend Adjustment method yielded a MAD of = 479.51 and Seasonal Variations method yielded a MAD of = 545.54.

4) The results of comparing measurement error of both method

Comparing the expectation of the expected quantity of okra purchased in January, it was found that the demand forecast from the Seasonal Variations method was less inaccurate than the Exponential Smoothing with Trend Adjustment method. Therefore, the researcher chose the forecasting method for Seasonal Variations with demand data.

CONCLUSION AND FUTURE WORK

From the study of data on the demand for okra. It was found that there was a trend and a seasonality. Therefore, 2 forecasting methods, Exponential Smoothing with Trend Adjustment and Seasonal Variations were selected for comparison. It was found that Seasonal Variations had less error.

Therefore, the Seasonal Variations method was used to forecast demand in the next month. To find the possibility to prepare the area for cultivation of okra to reduce wastage or waste of production without benefit. Including selecting good suppliers will increase efficiency in planning and create competitive advantages. (Wannee Sutthachaidee, 2022)

Studying the data, the researcher has collected data for only a period, making it possible to know the forecasting value for only a period. It may be necessary to collect additional information to know the accuracy of the forecasts to increase. In addition, the forecasting method, the researcher has chosen only 2 methods. If there is more information, other forecasting methods may be used in forecasting.

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