

IMPLEMENTATION OF SES TECHNIQUES IN THE NEEDS FOR BROILER CHICKEN MEAT IN ASAHAN DISTRICT

Teguh Gilang Maulana Marpaung^{1*}, William Ramdhan¹, Abdul Karim Syahputra²

¹Information System, Sekolah Tinggi Manajemen Informatika dan Komputer Royal

²Computer System, Sekolah Tinggi Manajemen Informatika dan Komputer Royal

*email: *gilangmarpaung8544@gmail.com*

Abstract: The Asahan Regency Animal Husbandry and Animal Health Service carries out outreach activities on the level of demand for boiler chicken, which means that the department must be more active in collecting data on the volume of boiler chicken every year because consumer demand for chicken continues to increase and instability often occurs. Where in the period 2012 to 2024 there was a significant increase in demand. So it becomes an obstacle in the stock of chickens in the Asahan Regency market which must be prepared. If there is too much chicken supply but the demand for chicken consumption decreases then this will result in a loss, conversely if the demand for chicken consumption increases but the chicken supply cannot be prepared then this will be a loss for chicken traders and distributors. To increase the accuracy of the estimates, the use of the Single Exponential Smoothing Method is proposed. This method smooths past values with exponential weights, placing greater emphasis on recent data. Using data from the last 12 (twelve) years as reference data for recording the past for forecasting experiments for the next 1 (one) month. Experiments using different Alphas test accuracy in actual situations. The results of the experiment with an alpha of 0.9 are almost the same as the actual value in predicting the situation one year into the future with the lowest error, namely MAPE 7.4% and forecasting broiler chicken meat supplies of 13661261.46 chickens.

Keywords: broiler chicken; ses method; web based.

Abstrak: Dinas Peternakan dan Kesehatan Hewan Kabupaten Asahan melakukan aktivitas penyuluhan tingkat permintaan ayam boiler dimana pihak dinas harus lebih aktif dalam melakukan pendataan volume ayam boiler setiap tahunnya karena permintaan konsumen terhadap ayam sering terjadi ketidakstabilan. Dimana pada periode tahun 2012 sampai dengan 2024 terjadi kenaikan permintaan yang signifikan. Sehingga menjadi kendala dalam stok ayam di pasar Kabupaten Asahan yang harus disiapkan. Jika persediaan ayam terlalu banyak namun permintaan akan konsumsi ayam menurun maka ini akan menjadi kerugian, sebaliknya jika permintaan akan konsumsi ayam meningkat namun persediaan ayam tidak dapat disiapkan maka ini menjadi kerugian bagi pihak pedagang dan distributor ayam. Untuk meningkatkan ketepatan perkiraan, penggunaan Metode Single Exponential Smoothing diusulkan. Metode ini menghaluskan nilai masa lalu dengan bobot eksponensial, memberikan penekanan lebih besar pada data terbaru. Penggunaan data 12 tahun terakhir sebagai data acuan pencatatan masa lalu untuk percobaan peramalan untuk 1 (satu) bulan kedepan. Penggunaan Alpha yang berbeda menguji akurasi dalam situasi aktual. Hasil dari penelitian dengan alpha 0,9 hampir sama dengan nilai aktual dalam meramalkan keadaan satu tahun ke depan dengan error yang paling rendah yaitu MAPE 7,4% dan peramalan persediaan daging ayam broiler sebanyak 13661261,46 ayam.

Kata kunci: berbasis web; daging ayam broiler; metode ses.

INTRODUCTION

The increase in population and improvements in people's living standards have caused demand for various food needs to continue to increase. Increasing consumption of animal protein in line with public awareness of nutrition. Based on BPS Susenas 2022 data, Indonesia's largest consumption of animal protein is specifically Asahan Regency which requires broiler chicken meat.

Dinas Kesehatan dan Peternakan Kabupaten Asahan carries out outreach activities on the level of demand for broiler chicken, which means that the department must be more active in collecting data on the volume of broiler chicken every year because consumer demand for chicken continues to increase.

So far, the department has only applied a very simple calculation method, namely predicting demand for chicken which always changes every year using data from 2012 to 2023. This will make it easier for related parties, especially the Asahan Regency Animal Husbandry and Health Service, to quickly make the right decisions in predicting demand for chickens in the future, so that they can find solutions to meet increasing consumer demand or excess stock, therefore a system is needed. Forecasting is a calculation analysis technique carried out using approach to estimate future events using references to past data to minimize the influence of uncertainty. Forecasting itself can be short, medium or long term for a company. Forecasting is a very important tool in effective and efficient planning [1].

From previous research including the title " Single Exponential Smoothing: Method for Forecasting Vaccine Needs

Measles" [2], The analysis technique for system forecasting uses the SES method, while the system testing uses a Blackbox. Our findings show that the lowest MAPE value was obtained at 49.8%. The results of testing the system using a Blackbox that all components in this system are already functioning properly. With this system, it can make it easier for related parties to predict the number of measles vaccines in the new Gambir health center.

Comparative Analysis of Single and Single Exponential Smoothing Methods Moving Average in Order Forecasting [3], Forecasting using the time series method, namely SES and SMA, the forecasting model is obtained from the actual data used in this case study, the forecasting model using the SMA method is declared very good because it has a MAPE value <10% while the SES method is declared good because it has a MAPE value. = 11% (10-20%). The SMA method has an error rate that is more sophisticated than the SES method. For forecasting order requests in this study, the SMA method is better used because it has the smallest error rate in forecasting.

Application of Single Exponential Smoothing in forecasting Job Opportunities for Registered Job Seekers" [4], to find out the general picture of Job Opportunities for Registered Job Seekers at the Tanjungbalai City Employment Service, to find out the model of the Single Exponential Smoothing method that is applied in The system can be used by the Tanjungbalai City Employment Service in order to reduce the limited number of Job Opportunities for Registered Job Seekers using the Single Exponential Smoothing method, knowing the MAPE value from the Single Exponential

Smoothing method for forecasting Job Opportunities for Registered Job Seekers at the Tanjungbalai City Employment Service in 2022 using the method Single Exponential Smoothing.

Further research with the title "Application of the Single Exponential Smoothing Algorithm to Predict the Number of Prospective New Students" [5], the results of this research consider random, trend and seasonal influences on past data that will be smoothed. The results obtained by namely the use of Single Exponential Smoothing, can be calculated in 2023 by 280 students from the predicted results. Further research with the title "Prediction of Sales of Electronic Equipment on CV. Maju Jaya Based on Single Exponential Smoothing (SES) [6], research results show that sales for 2023 are 228, with a MAPE value of 27.89 and MAD 70.09. Subsequent research with the title "Application of the Single Exponential Smoothing Method in Website-Based Coffee Sales Forecasting (Case Study: HU Coffee Shop)" [7]. For this test, coffee sales data was used with sales data from April 2022 to July 2023. The sample used for this research was HU Milk Coffee and the data used was June 1, 2023 to July 10, 2023.

Further research with the title "Application of Exponential Smoothing on GRDP Growth Rates on the Basis of Constant Prices According to Business Fields in Central Java Province"[8], Research Results Show that the method that can provide the best forecasting is the Triple Exponential Smoothing method with alpha parameters of 0.29, beta 0.7 and gamma 0.68 obtained an RMSE value of 2.68 and MAE 1.24. The forecast values produced in Quarter III 2023 to Quarter II 2024 respectively are 5.175; 5,171; 4,736; and 5,497. Further

research with the title "Forecasting Analysis of Internet Installations Using the Single Moving Average and Exponential Smoothing Method"[9], the results obtained are that the demand for installing Stroomnet services in October 2022 using the single moving average method for 3 months is 28 While using the single Exponential Smoothing method there are 26 people.

Single Exponential Smoothing Analysis for Predicting Chicken Sales [10]. The results of this study prove that the application of the Single Exponential Smoothing method in forecasting broiler sales makes it easier for Syahbana Group 2 because the forecasting system provides a good accuracy value in providing sales planning for the following month.

A solution is needed in this case form a capable forecasting system to predict future demand for broiler chicken meat, which Later it will become a reference in the process of restocking goods. Therefore, single exponential smoothing method is used to forecast the amount of demand for broiler chicken meat, especially when the data shows seasonal trends and patterns. By applying this method in information systems, those it is hoped that forecasting can be carried out with minimal and approximate error rates actual value, so that the Asahan District Animal Husbandry and Animal Health Service can Estimate the amount of broiler chicken meat for the next time period and avoid losses

METHOD

Quantitative methods use various mathematical models that rely on historical data to estimate demand for

broiler chicken meat. The framework stages carried out as follows:

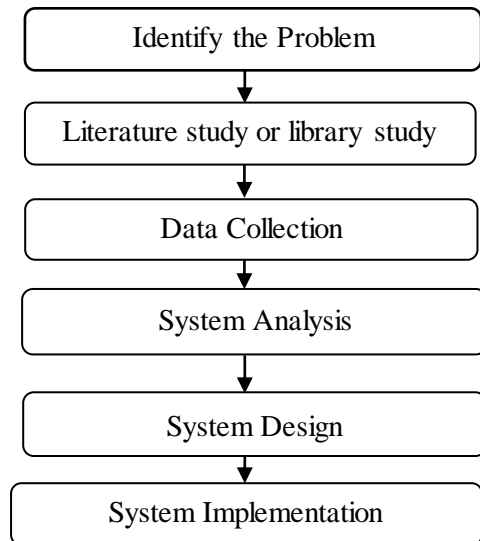


Image 1. Research Framework

Identify The Problem

The problems identified in this research. There is a demand for broiler chicken meat each year that cannot be predicted by the Asahan District Animal Husbandry and Animal Health Service. It is difficult to determine the need for broiler chicken meat, so it does not match the amount of supply demanded by consumers. There is no forecasting system for the need for broiler chicken meat, resulting in a reduced supply of building materials.

Literature Study or Library Study

After identifying the problem, the carried out a literature study by searching for theoretical foundations obtained from various sources to complete the concepts and theories, so that they have a good and appropriate scientific basis.

Data Collection

The data collection stage was carried out after literature study and problem identification. Data collection is

a technique or method used by to collect data. Data collection is carried out in order to obtain the information needed to achieve research objectives. Meanwhile, data collection instruments are tools used to collect data. Because it is a tool, the data collection instruments can be interviews and observations. The data taken is data on the amount of meat needed for broiler chickens by taking data from the previous period.

System Analysis

After collecting data, the made a system analysis aimed at knowing the forecasting system for the need for broiler chicken meat. Following are the problems that occurred. The Asahan Regency Livestock and Animal Health Service cannot yet predict demand for broiler chicken meat in the next period. The Asahan District Animal Husbandry and Animal Health Service often experiences excess and shortage of broiler chicken meat stocks. For this reason, an information system was created, namely forecasting the need for broiler chicken meat using the Exponential Smoothing method at the Asahan District Livestock and Health Service.

System Design

This stage was carried out after the carried out a system analysis and identified the obstacles and problems that occurred. System design an activity of designing and processing an information system from the results of system analysis so that it can meet the needs of users.

System Implementation

The next stage namely the implementation stage where at this stage the ses method is applied to help

forecasting. The Single Exponential Smoothing (SES) method is a method that uses very little past data recording and assumes fluctuating or unstable data. Exponential smoothing is a weighted moving average forecasting technique where data is weighted by an exponential function [11], Exponential smoothing a moving average forecasting method with sophisticated weighting, but is still easy to use [12].

The single exponential smoothing (SES) method a procedure by repeating calculations continuously using the latest observation data, each data used in this method is given a weight which is symbolized α (alpha) alpha value which ranges from 0 to 1 which produces a level value that error the smallest will be selected for use in the forecasting model [13].

Application of the Single Exponential Smoothing Method in Sales Forecasting at UD. Rich Web Based Flavor [14]. The SES Application Uses the Single Exponential Smoothing Method to Predict the Lowest Price of EUR/USD [15]. The formula of the Single Exponential Smoothing method as follows:

$$F_{t+1} = \alpha X_t + (1-\alpha) F_t \quad (1)$$

Description:

α : Parameter value of $0 < \alpha < 1$

X_{t-1} : Actual value at time(t-1)

F_{t-1} : Forecasting value at time(t-1)

F_t : Forecasting value at time t

The accuracy of a forecast can be measured by several measures, among others:

Mean Square Error (MSE)

Mean square of the difference in value between the estimated value and the actual value.

$$MSE = \frac{\sum |x_t - F_t|^2}{n} \quad (2)$$

Mean Absolute Deviation (MAD)

$$MAD = \sum \left(\frac{\text{Actual-Forecast}}{n} \right) \quad (3)$$

Mean Absolute Percentage Error (MAPE)

$$MAPE = \left(\frac{100\%}{n} \right) \sum_{t=1}^n \left| \frac{x_t - f_t}{x_t} \right| \quad (4)$$

The calculation algorithm using the Exponential Smoothing method in predicting demand for broiler chicken Calculation of Forecasting Broiler Chicken Meat Demand Using Alpha (α) 0.9.

Table 1. Forecasting Demand for Broiler Chicken

Years	Broiler Chicken	Forecast SES
2012	6.448.603	
2013	6.924.723	6448603,00
2014	7.116.437	6877111,00
2015	7.159.943	7092504,40
2016	8.500.620	7153199,14
2017	8.795.300	8365877,91
2018	11.029.838	8752357,79
2019	13.130.163	10802089,98
2020	13.261.465	12897355,70
2021	13.394.069	13225054,07
2022	13.245.442	13377167,51
2023	13.706.000	13258614,55
2024		136612161,5

Calculation errors in forecasting demand for broiler chickens at the Asahan Regency Livestock and Health Service. This aims to determine the level of accuracy in the results predicted by the SES method.

Table 2. Analysis of Forecasting Errors

Broiler Chicken	Forecast	MAPE(%)
6.448.603		
6.924.723	6448603,00	6,88%
7.116.437	6877111,00	3,36%
7.159.943	7092504,40	0,94%
8.500.620	7153199,14	15,85%
8.795.300	8365877,91	4,88%
11.029.838	8752357,79	20,65%
13.130.163	10802089,98	17,73%
13.261.465	12897355,70	2,75%
13.394.069	13225054,07	1,26%
13.245.442	13377167,51	0,99%
13.706.000	13258614,55	3,26%
Total		78,56%

The results of forecasting Broiler Chicken can be seen from the Single Exponential Smoothing method using Alpha (α) 0.1 to 0.9 as follows:

Table 3. Results of Error Forecasting Demand for Broiler Chickens

Forecast	Alpha (α)	MAPE %
9850148,92	0,1	26,22
11682945,15	0,2	20,58
12645394,02	0,3	16,56
13135843,45	0,4	13,66
13379502,18	0,5	11,51
13501636,23	0,6	9,91
13569677,17	0,7	8,71
13617740,19	0,8	7,85
13661261,46	0,9	7,14

Sample testing used (0.1 to 0.9), the smallest error value was obtained using 0.9 which obtained an error value of 3.09% with forecasting results for the 2024 period, namely 13661261.46 chickens for broiler meat needs. After the forecasting results are obtained, this can be something that helps consider the estimated decision in determining the quota for boiler chicken meat

RESULT AND DISCUSSION

The implementation of forecasting demand for broiler chickens at the Asahan Regency Animal Husbandry and Health Service using the Single Exponential Smoothing (SES) method was carried out using the PHP programming language and the database used was MySQL.

Main Menu Page

If the user had been successfully logged in, the main menu page of the broiler meat demand forecasting system for the Asahan Regency Animal Husbandry and Health Service will appear.



Image 2. Main Menu Page

Input Data On The Type Of Demand

Next, the form for the type of meat requirement displayed in the broiler meat demand forecasting system at the Asahan Regency Livestock and Health Service. There are several types of broiler chickens obtained from various regions, they need to be input into the system. The broiler chicken request type input system consists of a field containing the code and type of chicken as follows:

Image 3. Broiler Chicken Demand Form

Forecasting Results Report

The following the result of a forecast report on demand data for broiler chickens at the Asahan District Animal Husbandry and Animal Health Service

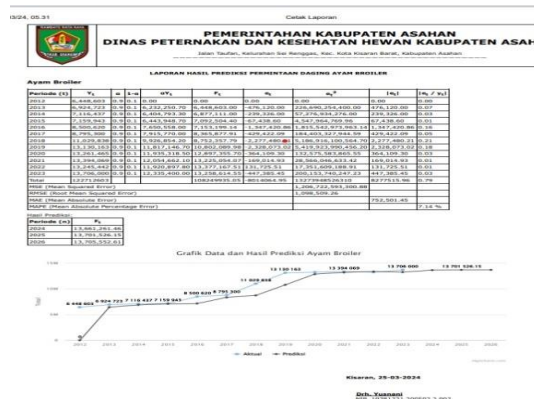


Image 4. Forecasting Results Report

CONCLUSION

The estimates that have been made and The forecasting system created has succeeded in predicting the next demand for broiler chickens in Asahan Regency one year period. By using single exponential smoothing method (SES), viz the estimated demand for broiler with α 0.9 and an error rate of 7.4% (MAPE). Test results using this method is able to provide decisions for the Asahan Regency Animal Husbandry and Health

Service to achieve target consumer demand.

After carrying out various stages of research, results have been obtained in the form of an information system that applies forecasting using the SES method to overcome the problem of demand for broiler chickens in Asahan district. With this system, it is hoped that it will make it easier for the relevant agencies to imagine the demand for broiler chickens so that they can minimize supply shortages or excess supply of broiler chickens. The system has been designed using the PHP programming language and the interface design is well designed so that the relevant agencies can use it comfortably

BIBLIOGRAPHY

- [1] E. Kurniawan and M. Handayani, "Penerapan Metode Single Exponential Smoothing Untuk Prediksi Penjualan Bahan Bangunan," vol. 4, no. 2, pp. 896–905, 2022, doi: 10.47065/bits.v4i2.2140.
- [2] V. No, A. Azzahra, W. Ramadhan, and W. M. Kifti, "Edumatic : Jurnal Pendidikan Informatika Single Exponential Smoothing: Metode Peramalan Kebutuhan Vaksin Campak," vol. 6, no. 2, pp. 215–223, 2022, doi: 10.29408/edumatic.v6i2.6299.
- [3] N. Lisnawati, H. Syafwan, and N. Nehe, "Penerapan Metode Single Exponential Smoothing (SES) dalam Peramalan Jumlah Ikan," vol. 4, no. 2, pp. 829–838, 2022, doi: 10.47065/bits.v4i2.2132.
- [4] I. K. Siregar, "Penerapan Single Exponential Smoothing Dalam peramalan Kesempatan Kerja

- Terhadap Pencari Kerja Terdaftar,” vol. 4, no. 2, pp. 813–818, 2022, doi: 10.47065/bits.v4i2.2082.
- [5] P. A. Boli and R. P. Kristianto, “Penerapan Algoritma Single Exponential Smoothing untuk Prediksi Jumlah Calon Mahasiswa Baru,” vol. 6, no. November 2022, pp. 301–306, 2023, doi: 10.30865/komik.v6i1.5686.
- [6] P. Octavia, L. Iryani, and N. Umilizah, “PREDIKSI PENJUALAN ALAT ELEKTORNIK PADA CV . MAJU JAYA BERDASARKAN SINGLE EXPONENTIAL SMOOTHING,” vol. 1, no. 1, pp. 11–17, 2023.
- [7] F. R. Wati, S. Achmadi, and A. P. Sasmito, “Penerapan Metode Single Exponential Smoothing Dalam Peramalan Penjualan Kopi Berbasis Website (Studi Kasus : Toko Kopi HU),” vol. 7, no. 5, pp. 1–6, 2023.
- [8] I. Nasichah, “Penerapan Exponential Smoothing Pada Laju Pertumbuhan PDRB Atas Dasar Harga Konstan Menurut Lapangan Usaha Provinsi Jawa Tengah,” vol. 7, pp. 684–693, 2024.
- [9] F. Suryani, R. A. N. Moulita, and S. Aprilyanti, “Analisis Peramalan Pemasangan Internet dengan Menggunakan Metode Single Moving Average dan Exponential Smoothing Analysis of Internet Installation Forecasting using Single Moving Average and Exponential Smoothing Methods,” vol. 1, pp. 1–5, 2023.
- [10] D. I. Suryani, M. Siddik, M. Ihsan, M. Prodi, S. Informasi, and S. Royal, “Analisis Single Exponential Smoothing Untuk Memprediksi Penjualan Ayam,” vol. 9, no. 3, pp. 2–10, 2022.
- [11] F. R. Alfandi, Y. A. Pranoto, and F. X. Ariwibisono, “Peramalan Stok Bahan Baku Di Cafe Vosco Dengan Metode Ses (Single Exponential Smoothing) Berbasis Website,” vol. 7, no. 5, pp. 3199–3205, 2023.
- [12] M. Ena, P. S. Matematika, and U. T. Kalabahi, “Penerapan Metode Single Exponential Smoothing Dalam Memprediksi Jumlah Penerimaan Mahasiswa Baru Tahun 2023,” vol. 4, no. 2, pp. 962–969, 2023.
- [13] R. Maulina and D. P. Anggraeni, “Evolusi: Journal of Mathematics and Sciences Metode Single Exponential Smoothing (SES) pada Peramalan Tingkat Pengangguran Terbuka di Indonesia,” vol. 6, pp. 111–120, 2022.
- [14] T. Kemendikbud, S. K. No, D. Ud, K. Rasa, B. Web, and K. Kunci, “Penerapan Metode Single Exponential Smoothing Pada Peramalan Penjualan,” no. 204, pp. 40–49, 2023.
- [15] B. R. Ramadhan, M. K. Azis, and M. K. Wafa, “Aplikasi SES Menggunakan Metode Single Exponential Smoothing Untuk Memprediksi Harga Terendah EUR / USD,” vol. 2, pp. 89–94, 2023.