**DEMANDEST - AI POWERED FOOD DEMAND FORECASTER**

LITERATURE SURVEY

[1]

Unsustainable use of water resources and environmental degradation as related to global [food production](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/food-production) systems are critical issues of concern. However, reducing food [wastage](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/wastage) along the supply chain can provide the needed solutions to resources and environmental conservations, while meeting food demand. This study quantified the [wastage](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/wastage) of common food types at each stage along the supply chain in Korea using top-down mass flow analysis for the period of 2007–2017. The principal component analysis (PCA) was used to rank the food types based on their contribution to the total wastage. The water resources and [GHG emissions](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/greenhouse-gas-emission) associated with food wastage were assessed using the production footprint concept, after which prediction models were developed. The estimated food wastage was 14.97 ± 1.2 million tonnes, with production, postharvest, processing, distribution, and consumption representing 14%, 11%, 13%, 15%, and 46%, respectively. Vegetables, maize, and rice were ranked as the highest food types contributing to the total wastage, while mutton and rapeseed were the least. Our results indicated 15.24 ± 1.95 billion m3 and 20.08 ± 6.14 megatonnes CO2eq of water footprint and [GHG emissions](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/greenhouse-gas-emission) associated with food wastage, respectively, with substantial variations among the 28 major food commodity types. The prediction models using Bradley-Terry fitted well for the trend analysis of water footprint and GHG emission associated with food wastage. The prediction suggested that the total food supply, total wastage, water footprint, and GHG emission were estimated to reach 54.89 million tonnes, 16.91 million tonnes, 18.63 billion m3, and 27.41 megatonnes CO2eq by 2030, respectively. This study is of utmost importance considering the strong desire of the Korean government to pursue food self-sufficiency in the face of constraint water resources and GHG emission reduction target.

[2]

This paper reviews the research literature on forecasting retail demand. We begin by introducing the forecasting problems that retailers face, from the strategic to the operational, as sales are aggregated over products to stores and to the company overall. Aggregated forecasting supports strategic decisions on location. Product-level forecasts usually relate to operational decisions at the store level. The factors that influence demand, and in particular promotional information, add considerable complexity, so that forecasters potentially face the dimensionality problem of too many variables and too little data. The paper goes on to evaluate evidence on comparative forecasting accuracy. Although causal models outperform simple benchmarks, adequate evidence on machine learning methods has not yet accumulated. Methods for forecasting new products are examined separately, with little evidence being found on the effectiveness of the various approaches. The paper concludes by describing company forecasting practices, offering conclusions as to both research gaps and barriers to improved practice

[3]

In this paper, A significant challenge in the university meal booking is the high NoShow rate that leads to considerable food waste in consequence of facing low price of nutrition system and government subsidizing. This study aims to prevent food waste in university dining halls via predicting actual demand. Methods: To model and solve the problem, an Artificial Neural Network has been used that was performed by weighting the error function with Generalized Pattern Search (GPS). Date, the day of the week, the price level of Food, total number of reservations, total number of reservations by undergraduate students, Masters' students, PhD students and dormitory students and the parallel food have been considered as inputs of the model. The output is the actual demands based on Show's number. Results: The seven-year data of the meal booking system of a large university in Iran has been examined. This data demonstrated that the food waste rate is close to 10% of the total food reservations. An artificial neural network including weighted error function under GPS optimization was obtained to predict actual demand. Finally, the results of training indicated over 80% waste reduction in surplus daily food production

[4]

Understanding the dynamics of food banks' demand from food insecurity is essential in optimizing operational costs and equitable distribution of food, especially when demand is uncertain. Hence, Gaussian Mixture Model (GMM) clustering is selected to extract patterns. The novelty is that GMM clustering is applied to identify the possible causes of food insecurity in a given region, understanding the characteristics and structure of the food assistance network in a particular region, and the clustering result is further utilized to explore the patterns of uncertain food demand behavior and its significant importance in inventory management and redistribution of surplus food thereby developing a two-stage hybrid food demand estimation model. Data obtained from a food bank network in Cleveland, Ohio, is used, and the clusters developed are studied and visualized. The results reveal that this proposed framework can make an in-depth identification of food accessibility and assistance patterns and provides better prediction accuracies of the leveraged statistical and machine learning algorithms by utilizing the GMM clustering results. Also, implementing the proposed framework for case studies based on different levels of planning led to practical results with remarkable ease and comfort intended for the respective planning team.

[5]

The food and beverage industry is one of the most important sectors of the Brazilian economy, with a significant participation in GDP index. The Brazilian economy has been showing a relative stability in the last decades, which takes the sales demand to be more predictable. Due to this scenario of economic stability, the companies has been worried about investing in planning their operations, making use, mainly, of forecasting methods in order to become more competitive in the market. In the case of food industry, the seasonal and the short perishability factors are a limitation to the maintenance of stocks, requiring a forecast with a high accuracy level. The present work consists in applying methods to forecast the demand for products of a food industry, which directs its sales to the food service market, in order to base the short to medium term production planning. Posteriorly, the forecasts will be evaluated using the error measure MAPE and compared to the demand currently considered by the company. The proposed methods feature a reduction of the error approximately 5%.

[6]

The purpose of this paper is to establish correlations among the input variables of production within themselves and input variables of consumption within themselves and to forecast the production and consumption of the rice.

The production and consumption of rice crop is governed by diverse variables. In the present study five key input variables for production of rice based on literature review and the authenticated data available from agricultural sources have been selected. These variables are area sown, agricultural workers (AW), area irrigated, growth rate and yield per hectare. On similar basis four key input variables responsible for consumption of rice are considered, namely, price of rice, population, poverty ratio and per capita net national product (NNP).Correlation analysis showed that priority wise production of rice depends upon yield per hectare, percentage irrigation, AW and area sown. The growth rate is found to be having insignificant correlation with other variables of production and hence was omitted from subsequent study. Correlation analysis also showed that priority wise consumption depends upon whole sale price per ton, population and the per capita NNP. The poverty ratio is found to be having insignificant correlation with other variables of consumption and hence was omitted from subsequent study. The outcomes of the correlation analysis are utilized for designing rule base for fuzzy inference system (FIS) to forecast the production and consumption of the rice. Subsequently Bayesian technique is used to forecast production and consumption and its results are compared with the results of fuzzy inference analysis.

There are many techniques used for forecasting purpose but FIS and Bayesian technique outperform others. In the present study, the authors therefore focussed on these two techniques. Bayesian technique takes into account the expert opinion at the current conditions whereas FIS uses previously designed rule base. Besides discussing the appropriateness of these two techniques for forecasting production and consumption of rice, their forecasting outcomes will help in logistical and operational planning of the resources at national level, farmers’ level and traders’ level.

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