

# An Effective Multiple Linear Regression-Based Forecasting Model for Demand-Based Constructive Farming

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## ABSTRACT

Demand planning plays a very strategic role in improving the performance of every business, as the planning for a whole lot of other activities depends on the accuracy and validity of this exercise. The field of agriculture is not an exception; demand forecasting plays an important role in this area also, where a farmer can plan for the crop production according to the demand in future. Hence, a system which could forecasts the demand for day-to-day food harvests and assists the farmers in planning the crop production accordingly may lead to beneficial farming business. This paper would experiment by forecasting the demand using multiple linear regression (EMLR-DF) for different food commodities and implements the model to assists the farmers in demand based constructive farming. Implementation results have proved the effectiveness of the proposed system in educating the farmers in producing the yields mapping to the demand. Implementation and comparison results have proved the proposed EMLR-DF is more effective and accurate.

## KEYWORDS

Agriculture, Business, Constructive Farming, Crop Production, Demand Planning, Forecasting, Multiple Linear Regression, Yield

## 1. INTRODUCTION

The farmers in developing countries like India are being faced by the age-old problems in the field of agriculture like there is no reliable and easy access to accurate weather forecasting, there is no easy access to government market portals, there is no common forum to consult the agricultural experts for discussion, there is no system to inform the farmers about new tools, technologies, and new governmental schemes, there is no synchronization between the demand and supply of food crops and list goes on. Demand-supply problem is one of the major problems being faced by the farmer community, where there is no synchronization in the production and demand for food crops. Due to this either farmer is failing to get good market prices when there is more supply than demand or consumer suffers high prices due to less production. To effectively tackle this problem, there is a need for some forum that forecasts the societal demand for different food crops and assists the farmers in growing the crops accordingly.

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Demand forecasting plays an important role in the success of any business. As the demand forecasting helps in efficient planning for production, supply, maintenance, and other activity, the performance of a business depends on the accuracy of forecasting. Demand forecasting also plays a strategic role in the field of agriculture, where a farmer can plan for the crop production according to the need of society. So, this work attempts to develop a model to forecast the demand for the food crops and assists the farmers in selecting a crop based on this demand.

The demand for any product can be defined as, the aspiration for a product/commodity reinforced by the ability and willingness to buy it (Triplett, 1976). Demand is a function of Price of the Commodity  $P_c$ , Relative Price  $R_p$ , Income  $I$ , Taste and Preference  $T_p$ , Future Expectation  $F_e$  and other factors  $O$  ("Demand, Supply, and Market Equilibrium," 2011; Whelan & Forrester, 1996). The relation of Demand with these parameters can be expressed as:

- **Price of the Commodity ( $P_c$ ):** Demand is contrariwise of the price i.e. the demand for a commodity will decrease with the increase in the price of a commodity and vice versa;
- **Relative Price of Commodity ( $R_p$ ):** For certain products, the price are directly related to associated product price, those products are called relative products. The relative price of the product is directly proportional to the associated product;
- **The income ( $I$ ):** The demand for a product will directly depend on the income of the people, an increase in income results in an increase in demand for the products. Consequently, the demand will decrease with the decreasing income;
- **Taste and Preferences ( $T_p$ ):** Taste and preferences of a consumers influence the demand for a commodity. With the change in taste and preferences of a consumer will affects the level of demand for various goods. Taste and Preferences may change due to the change in lifestyle, habits, etc.;
- **Future Expectation ( $F_e$ ):** Expectation in the future price variations of goods will also affect their demand predominantly for durable goods. The expectation of an increase in price will decrease the demand and vice versa;
- **Other Factors ( $O$ ):** Other factors such as population, weather and climate condition, taxation, advertisement etc. will also affect the demand of a commodity.

The Demand 'D' of the product could be represented as a function of the above parameters as  $D = f(P_c, R_p, I, T_p, F_e, O)$ .

But for some specific goods like food products, demand is not related to above-said factors and such goods are called necessary goods. such as food commodities like cereals, grains, vegetables etc. ("Demand Analysis and Forecasting," 2017). As the food commodities belong to the category of necessary goods, the demand for those commodities needs to be satisfied for the consumers by managing the supply accordingly. To regulate the demand and supply, demand for food commodities needs to be forecasted before and assist the farmers in planning their crop production accordingly. So that farmers can grow the food crops that would be in demand and caters the needs of the society. Demand forecasting for a product can be done using several methods (Ivano, 2017) such as Historical methods of forecasting which uses Opinion polling methods: consumer survey method, sales force opinion method and expert opinion method. Statistical methods could also be used to forecast the demand which uses trend projection method, barometric techniques, regression method, and simulations equation method. As the predictor variable 'Demand' is a numerical variable, Regression models are the best suitable for forecasting the demand values (Harlalka, 2018). Regression techniques are the most commonly used method in the process of demand forecasting (Hans, 2017).

Rest of the paper is organized as follows, the review of the existing works are discussed in section 2, section 3 gives a brief introduction to regression modes and section 4 explains the system architecture for the proposed demand forecasting model. The implementation and methodologies used in this work are described in section 5. Section 6 discusses the results and section 7 concludes the paper.

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