ESTIMATION OF CROP YIELD USING DATA ANALYTICS

LITERATURE SURVEY:

Agriculture is an essential one for human survival because it serves fundamental requirements. Crop yield prediction is an essential factor in agriculture practice. Farmers need information about the crop yield before sowing seeds in their fields to attain better yield. Data analytics is the trend that penetrated into agriculture field. Data analytics is used to improve the crop yield with better production rate. Different crop yield prediction methods were introduced to improve the crop production. In India crop yield is always season dependent and majorly influenced by the biological and economic causes of an individual crop. Reporting of progressive agricultural yield in all the seasons is an ample task and an advantageous task for every nation with respect to assesses the overall crop yield prediction and estimation. At present a common issue worldwide is, farmers are stressed in producing higher crop yield due to the influence of unpredictable climatic changes and significant reduction of water resource worldwide. A study was carried out to collect the data on world climatic changes and the available water resources which can be used to encourage advanced and novel approaches such as big data analytics to retrieve the information of the previous results to the crop yield prediction and estimation. Study imported that the selection and usage of the most desirable crop according to the existing conditions, support to achieve the higher and enhanced crop yield [1].

Analyzing the crop yield is necessary to update the policies to ensure food security. A research group conducted a study with the aim in suggesting a novel data mining method to predict the yields of crop depends on agricultural big data analytics methodologies, which were progressively contrast with conventional data mining methodologies in the process of handling data and modeling designs. Study suggested that the method employed should be user friendly, work based on progressive big-data responsive processing structure, supposed to utilize the existing agricultural based significant datasets and would still be used with the larger volumes of data growing at enormous rates. Nearest neighbors modeling is one such novel data mining technique which works on the results collected based on data processing structures form the farmers and suggest a well unbiased result on the base of accuracy and prediction time in advance. Study further discussed a case study on the assessment of actual crop dataset (numerical examples on) in China from 1995-2014. Study reported that the novel model employed has publicized an improved performance and was found to be progressive in reporting prediction accuracy percentage of the compared methodologies with conventional designs [2].

The crop yield with accurate prediction certainly benefits the farmers in choosing the right method to reduce the crop damage and gets best prices for their crops. A research group conducted a work with an objective of accurate prediction of crop yield through big data analytics to assess various crop yield influencing factors such as Area under Cultivation (AUC) interims of hectors, Annual Rainfall (AR) rates and Food Price Index (FPI) and to develop relationship among these parameters. Regression Analysis (RA) methodology was applied to examine the selected factors and their impact on crop prediction and final yield. RA methodology is a multivariable investigation practice which can categorize the factors in to groups such as explanatory and response variables and helps to assess their interaction to obtain a resolution. All the selected factors of the present study design known as AR, AUC and FPI were measured for a period of 10 years between the years 1990-2000. A novel method called Linear Regression (LR) is applied to analyze the relationship between explanatory variables (AR, AUC, FPI) and the crop yield considered as response variable. Study reported that the R2 value for the studied factors clearly indicate that crop yield is principally depends on AR. Study also reported that the other two factors (AUC and FPI) screened were also found to have significant impact after the AR. Study shall be continued to analyze the impact of for other substantial factors like Minimum Support Price (MSP), Cost Price Index (CPI), Wholesale Price Index (WPI) etc. and their relationship on the yields of different crops [3].

There is a term named Crop yield gaps, measured as difference between expected yields based on the potency and actual farm yield received. In order to achieve the higher crop yield, farmers must need to tackle the influencing factors such as influence of change in climate conditions on the prospects of crop yields, and change in the usage of agricultural land to assess and ultimately reduce the crop yield gaps. Several researchers reported the applications of bio simulation models to estimate the crop yield gaps in the last decade. The impact of the crop yield gaps assessment studies conducted through bio simulation based methodologies were negatively influenced by quality and resolution of climate and soil data, as well as unscientifically expectations about crop yield prediction systems and crop yield assessment modeling designs calibration method. An explicit rationale model which can effectively applied at various levels of the availability of quality information for identifying data sources to analyze crop yield and measuring yield gaps at definite geographical locations and works based on the rise in titer approach. The model is highly helpful in retrieving the useful data from the available, poor quality, less rigorous data sources or if the data is not available. A case study was discussed on the application of selected model design to quantify the yield gaps of maize crop in the state of Nebraska (USA), and also at the different geographical locations representing the nations Argentina and Kenya at national scale level. Different geographical locations such as Nebraska (USA), Argentina and Kenya were identified to symbolize

the distinct scenarios of Agri based data availability and the quality for the selected variables assessed to predict and estimate the crop yield gaps. The definitive aspiration of the planned method is to afford transparent, easily accessible, reproducible and technically sound and strong guidelines for predicting the yield gaps. The proposed guidelines were also relevant for understanding and to simulate the influence of change in climate conditions and usage of cultivable land changes from national to global scales. As indicated, the better understanding of data importance and usefulness for analyzing crop yield and estimating yield gaps as illustrated can help in identifying the data gaps in the crop yield and allow focusing on the various efforts taken at the global level to address the most critical issue [4].

There are also Simulation models based on field experiment are valuable technologies for studying and understanding crop yield gaps, but one of the critical challenge remain with these methods is scaling up of these approach to assess the data collated between different time intervals from the broader geographical regions. Satellite retrieved data have frequently been revealed to present data sets that, by itself or in grouping with other information and model designs, can precisely determine the yields of crop in agricultural lands. The yield maps developed shall provide an unique opportunity to overcome both spatial and temporal based scaling up challenges and thus improve the ideology of crop yield gaps prediction. A review was conducted to discuss the applications of remote sensing technology to determine the impact and causes of yield gaps. Even though the example discussed by the research group demonstrates the usefulness of remote sensing in the prediction of yield gaps, but also many areas of possible application with respect to the crop yield assessment, prediction and improvement remain unexplored. Study proposed two less complicated, easily assessable methods to determine and quantify the yield gaps between various agricultural fields. First method works closely with the constructive maps representing the average crop yields, it can be used directly to accesses specific crop yield influencing factors for further studies whereas the second method use the remote sensing technology to retrieve the data for providing the useful information regarding the crop yield prediction and estimation [5].

In upcoming decades,the two most significant and important factors found to influence crop yield is, increase in the global population and economy, which greatly demands the higher and sustainable agricultural based crop yields. The capacities of food production at global level is going to be very limited due to the less availability of cultivable land, water resources, difficulties in maintaining the sustainable crop production levels, effects of changes in the global climatic conditions and also by various biophysical parameters which influence the crop yield. The farmers need to be educated on the application of scientifically proven methods to quantify the crop yield capacities and same need to be informed to higher authorities to maintain transparency

in sharing the actual information, intern helps in making the policy based, research oriented, development and investment related decisions that aim to influence future crop yield. Crop production abilities and yield gaps can be assessed and measured by comparing the possible yields at normal conditions with respect to the crop production under, respectively, irrigated and rain fed conditions by keeping the crop yield levels limited by the less availability of the water as benchmarks. Yield gaps can be defined as the difference between the expected crop yields with respect to the actual crop yield and accurate, spatially unambiguous awareness and information about the yield gaps is necessary to achieve sustainable amplification of agricultural yields. Keeping an aim of discussing the impact of the various methods practiced in measuring the yield gaps with a spotlight on the local-to-global importance of outcomes, a research group carried out a survey on the various methods applied to estimate yield gaps. Study reported few standard operation methods, employed in quantifying the crop yield potential on the data collected from the farmers of western Kenya, Nebraska (USA) and Victoria (Australia). Study recommended for the use of accurate and recent yield data assessed through calibrated crop model designs and further up scaling validated methods in the prediction of crop yield gaps The bottom-up application of this global protocol allows verification of estimated yield gaps with on-farm data and experiments [6].

REFERENCES:

[1] R. Sujatha, P.Isakki Devi. A Study on Crop Yield Forecasting Using Classification Techniques, IEEE, 2016.

[2] Wu Fan, Chen Chong, Guo Xiaoling, Yu Hua. Prediction of crop yield using Big Data. 8th International Symposium on Computational Intelligence and Design. 2015.

[3] V. Sellam and E. Poovammal. Prediction of Crop Yield using Regression Analysis, Indian Journal of Science and Technology, 2016; 9(38).

[4] Patricio Grassinia, Lenny G.J. van Bussel, Justin Van Warta, Joost Wolf, Lieven Claessens, d, Haishun Yanga, Hendrik Boogaarde, Hugo de Groote, Martin K. van Ittersumb, Kenneth G. Cassman. How good is good enough? Data requirements for reliable crop yield simulations and yield-gap analysis. Field Crops Research. 2015; 49–63.

[5] David B. Lobell, The use of satellite data for crop yield gap analysis, Field Crops Research-143, 2013; 56–64.

[6] Martin K. van Ittersuma, Kenneth G. Cassmanb, Patricio Grassinib, Joost Wolfa, Pablo Tittonell, Zvi Hochmand. Yield gap analysis with local to global relevance-A review. Field Crops Research – 143, 2013; 4–17