Rice and Wheat are the two major grains in India. These two agriculture products dominate the agriculture economy of India. India is second largest country in terms of Rice production and always is in top five countries in the world for Wheat production. A variety of Rice and Wheat are produced across India at different states. These varieties of Rice and Wheat are sold at different markets at district levels. In this work a visualization tool using open source technologies is presented for demonstrating the price distribution information of Rice and Wheat varieties across India. The purpose of this work is to develop a tool for visual analysis of a particular Rice or Wheat variety price at different market level, district level and state level at a particular time frame and to compare the price fluctuations for different varieties across India. The presented tool can be utilized for agriculture economy studies and can also be used for studying the impact of different varieties of Rice and Wheat in agriculture market.

**Keywords:** Visual Analysis, Visualization Tool, Price Distribution, Agriculture Economy

**INTRODUCTION**

Wheat and Rice have the significant importance nationwide and data analysis for the Wheat and Rice is the need of the nation. With production of 70 to 75 million tons of wheat and 85 to 90 million tons of rice annually, with a huge and growing demand, India’s wheat and rice economies are now the second largest in the world. India produces a huge variety of Rice and Wheat is produced, around 70 different kinds of Rice and 50 types of Wheat is produced. The objective of this research is to develop a tool for visual analysis of Wheat and Rice prices across the India, with the help of latest technologies. Over the period of time these varieties changes on production side and in a consequent on market side. The prices of these verities of Wheat and Rice changes over the time and is also varies for different states across the India. The objective of the proposed tool is to visualize and perform the multidimensional analysis of Wheat and Rice price information from a number of dimensional
points of view for example the price behavior and distribution visual analysis can be performed on state level, district level, market level and variety wise over the period of selected time interval.

**OBJECTIVE OF THE PROPOSED WORK**

The objective of this research is to develop a tool for visual analysis of Wheat and Rice prices across the India. The objective of the proposed tool is to visualize and perform the multidimensional analysis of Wheat and Rice price information from a number of dimensional points of view for example the price behavior and distribution visual analysis can be performed on state level, district level, market level and variety wise over the period of selected time interval. The time interval can be daily, weekly, monthly, quarterly, yearly, etc. The following type of queries (for example) will be answered from the developed tool:

Q1: What is the price of same verity of Wheat across the various states of India in the year 2010?

Q2: How the price of a particular variety of Rice changes from 2006 to 2009 (time-interval) in Chhattisgarh?

Q3: What is the tendency of Wheat price for a particular price over the period across all the states in India?

Q4: What are the prices of different verities of Rice in Madhya Pradesh, Chhattisgarh and Karnataka in the year 2011?

**RELATED WORK**

For effective development of country there is a need of effective research on the Agriculture data for economic as well as for social improvements. Wheat and Rice are the two primary components in Agriculture particularly in India. Lots of research has been carried out by various researchers over the agriculture data in so many countries like Korea, India, Sri Lanka, Thailand, and USA for market analysis, comparative analysis, price behaviors, value chain analysis and economic analysis.


Although lots of research has been carried out by various researchers over the agriculture data and its price information in so many countries, still the visual presentation and analysis is not yet performed by any researcher. Apart from this the variety wise, state wise, district wise market wise distribution analysis is not yet explored in the earlier reported work. Also visualization and visual analysis techniques have been improved recently, which is not yet explored for the agriculture data.

**METHODOLOGY**

Methodology of the presented work is shown in the Figure 1. The work is carried in five major steps, which are explained in this section. The five stages are collecting the data from data sources, database preparation for analysis, filtering appropriate data for graphs generation, aggregating the data for graphs and generating the graphs using open source technologies.

A. Data Source – The Visual Analysis of the Wheat and Rice price information at various levels, i.e., State, District, Market and Variety wise will be carried out across the India. So, the work will be starting from collecting the authentic price information for various state, districts, markets across the India for different varieties of Wheat and Rice found and marketed across the India on day to day basis.

B. Database – Once the authentic raw data of

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<th>Figure 1: Methodology of Proposed Work</th>
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Wheat and Rice will be collected then the collected data is pre-processed and will be stored in the local database with properly designed schema for effective visual analysis and for effective generation of graphs.

C. Data Filtering – Once the data will be available on standard designed database schema for visualization, the next step is the data filtering from the database as per the choice of user for generating various graphs. Data filtering will depend upon the choice of user, for example if user wanted to visualize the variety wise price information for Wheat for a particular state in India, then subset of the data will be filtered from the database for the specified variety and state for Wheat only.

D. Data Aggregate – The next step is the data aggregation where aggregate computations will take place as per the user’s choice, for example if user wanted to see weekly price data in graphs then data consolidation will take place where the day wise data will be clubbed together to form the weekly data, and these consolidated data can be presented using various aggregate operators like sum, average, maximum, minimum and count (frequencies of the data values).

E. Create 2D Graphs – After the data aggregation step the appropriate two dimensional graphs will be generated with the help of open source API’s, and the generated graphs can be saved or exported to any suitable image format.

IMPLEMENTATION

Visualization tool is developed using open source technologies. The Graphical User Interface (GUI) is developed using Java programming language, whereas the backend database preparation is carried using MySql, an open source database management system. JFreeChart, a popular and open source Java based Application Programming Interface (API) is used for creating two dimensional graphs and charts for Rice and Wheat prices. The schema for the price information of Rice and Wheat is presented in the Figure 2.

The GUI for the developed tool is presented in the Figure 3. Using this interface, user can specify the varieties of Rice and Wheat for visualizing at different level for the different timeframes. Daily, Weekly, Monthly, Quarterly and Yearly analysis can be made for the selected varieties of Rice and Wheat across different locations of India.
The graphical user interface carries the following responsibilities:

i. Parameter Selection – User can select the time period, district, states, markets and variety of the Wheat and Rice as the parameter for graph generation.

ii. Process Attributes – Data filtering and aggregate computations.

iii. Query Interface - With the help of query interface, a user can specify the attributes for visualization. The result of query interface along with the some logically derived data is transferred to the visualization interface.

iv. Visualization Interface - The visualization interface is consisting of two separate implementation of 2D (2-Dimensional) visualization.

v. Graph Output – Two and three dimensional graphs can be saved / exported to the available standard image formats.

**DATASET**

Dataset from Open Government Data (OGD) Platform India is selected for Rice and Wheat price distribution information. The platform provides authentic data of last 12 years for Rice and Wheat prices of different markets at district and state level across India.

**SOME ILLUSTRATIONS**

In this section, some of the illustrations are presented to demonstrate the output of the presented tool. Illustration of Two Dimensional Line Graph for Comparing two Rice Varieties *Dosa* Rice and MP (Desi) at Yearly, Quarterly and Monthly Level is presented in the Figures 4, 5 and 6, respectively. The time series chart display average modalprice (frequent buying/selling price...
of the day/week/month/quarter/year) for selected varieties based on variety and year. The chart display corresponding month and year in x axis and display integer values for price in y axis. From the figures it is clearly visible that Dosa Rice is more costlier (having more economy impact) than MP (Desi) Rice across India.

Illustrations of bar chart for comparing two Rice varieties Dosa Rice and MP (Desi) at day level (daily analysis) is presented in the Figure 7. Similarly, in order to compare five different varieties of Rice at monthly level is presented in the Figure 8. The selected five varieties are Dosa
Rice, MP (Desi), Coarse, Dappa and Lokvan Rice. The figure clearly indicates that the varieties Dosa Rice and Lokvan carries more modal prices than the other Rice varieties.

CONCLUSION AND FUTURE SCOPE

An open source visualization tool is presented in this work to visualize the price distribution information of two popular grains Rice and Wheat across India. The tool is presented for visual analysis of the different varieties of Rice and Wheat sold across different states and districts at market level for a specified time frame. The tool can also be used for comparing the economical impact of individual variety across different district of India. In this work two dimensional graphs are generated for visual exploration of the price distribution information of Rice and Wheat varieties. Future scope of the presented work is to generate three dimensional graphs and charts for multi dimensional analysis of the price distribution information. The tool can also be extended to perform the multi dimensional analysis of Rice and Wheat prices by considering different level of analysis parameters.

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