

# Web Based Information Searching of Long Term Fertilizer Experiments for Decision Planning in Perspective of Climate Change

Kumar Sanjeev<sup>1</sup>, Suneeta Paswan<sup>2</sup>, Uma Kant Singh<sup>3</sup> and Mukul Kumar<sup>1</sup>

<sup>1</sup>Cum - Jr. Scientist, MBAC, Agwanpur, Saharsa, BAU, Sabour, Bihar

<sup>2</sup>SMS, KVK, Agwanpur, Saharsa, BAU, Sabour, Bihar

<sup>3</sup>Jr. Scientist– Cum - Assistant Prof., RRS, Agwanpur, Saharsa, BAU, Sabour, Bihar

E-mail: [ksanjev1@yahoo.co.in](mailto:ksanjev1@yahoo.co.in)

---

**Abstract**—Climate change is widely recognized as one of the most complex challenges that humankind has to face in the next decades. As agriculture is likely to suffer the biggest impacts, sound adaptation processes are required to sustain agricultural production and food system as a whole. The information needs of agricultural research data are growing day by day and there is a need to develop information system for meeting research demands and making this available online for use of planners, research system under National Agricultural Research System (NARS). Information System for Long Term Fertilizers Experiments (LTFE) is an attempt to develop such a web based user-friendly, integrated solution for the data management activities. It is developed as online information searching system for long term fertilizer experiments.

It has a three-layered architecture. Client Side Interface Layer implemented in HTML and JavaScript, Server Side Application Layer in Java Server Pages and Java Database Connectivity. Database Layer is implemented in Microsoft Access 2000. This system can be implemented as a network-based system with a server at a central location (IASRI) so that information is available on-line. The system runs at any node of the Internet through a browser. Security features are provided in such a way that only concerned person can access the database. There is provision to insert and update the information. This system provides search facility for centre information, experiment information, bifurcate information, weather parameters, crop information, fertilizer dose, experimental data, and experimental data with bifurcated treatments. It is useful for planning, designing and statistical analysis of data relating to experiments conducted under the AICRP on LTFE in perspective of climate.

**Keywords:** LTFE, Long Term Experiments, Database, Search engine, Web-based, JSP.

## 1. INTRODUCTION

Climate change is widely recognized as one of the most complex challenges that humankind has to face in the next decades. As agriculture is likely to suffer the biggest impacts, sound adaptation processes are required to sustain agricultural production and food system as a whole. The information needs

of agricultural research data are growing day by day and there is a need to develop information system for meeting research demands and making this available online for use of planners, research system under National Agricultural Research System (NARS). Information System for Long Term Fertilizers Experiments (LTFE) is an attempt to develop such a web based user-friendly, integrated solution for the data management activities. It is developed as online information searching system for long term fertilizer experiments. This information system would also provide a common platform for studying / understanding the complex interactions involving soils, plants, climate and management practices and their effect on crop productivity. The preparation of National Information System on Long Term Fertilizer Experiment (NISLTFE) assumes more importance and usefulness in the era of information Technology for establishing networking between ICAR institutes and SAUs with IASRI as a nodal point under a computer network.

### 1.1. Scenario of Long Term Experiments

Long Term Experiments are those, which are conducted on the same set of experimental units over a sequence of years with pre-planned sequence of treatments or crops or both and are mainly carried out to study the long term effects of given treatments and crops on soil fertility and economic returns. These may be with seasonal crops, annual crop sequences, perennial crops or a combination of three. Long term fertilizer experiments, long term rotational experiments etc. fall under the category of long term experiments with seasonal crops or annual crops sequence. These experiments include fertilizer experiments with cereal crops, irrigation experiments, tillage experiments, NPK status of soil, experiments on biomass production of cereals, experiments on crop rotation, effect of green manure etc.

**1.2. All India Coordinated Research Project on LTFE**

As the agriculture scenario of the country changed due to research, the use of biocides, high yielding fertilizer responsive dwarf varieties of crops, multiple cropping systems increased at a great pace. The use of fertilizers became a key factor for increasing agricultural production. Therefore a need was felt for studying the impact of fertilizers not only on the crop yield and quality but also on the soil and environment under intensive cropping system. In the light of these emerging situations the Indian Council of Agricultural Research launches the All India Coordinated Research Project (AICRP) on Long Term Fertilizer Experiments at 17 center at different location. At the behest of the project coordinator (LTFE), IASRI started collaborating with AICRP. As a result, data on long term fertilizer experiments at permanent sites under AICRP and LTFE was received, processed and maintained at IASRI. This data was augmented further with that on long term experiments being conducted elsewhere in India under Crop and Horticulture Division of the ICAR for preparing a National Data Base (Agro Eco System Wise), so as to provide a common platform for a study. Hence, an AP CESS funded project entitled ‘National Information System on Long Term Fertilizer Experiments’ under NRM division of ICAR was formulated and is functioning from 1<sup>st</sup> June, 2013.

**1.3. Data Storage of LTFE in Electronic Form**

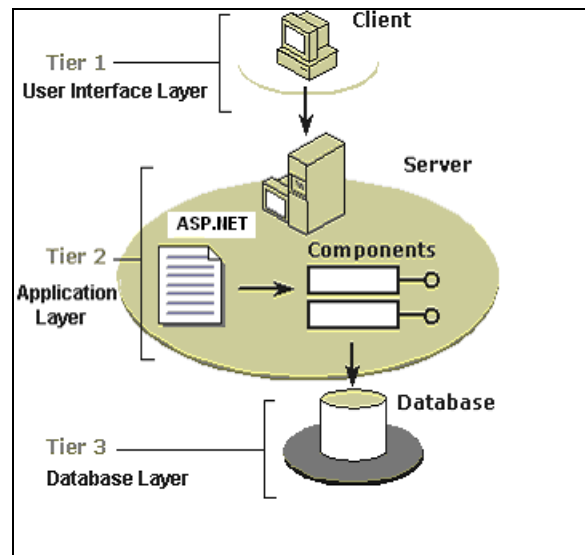
The data of the following characters for each crop under the cropping system are being received from all the cooperating centers every year.

- (i) Yield: Grain and Straw
- (ii) Plant nutrient uptake separately for grain and straw in respect of:
  - Primary nutrients – N, P and K
  - Secondary nutrients – Ca, Mg and Sulphur
  - Micronutrients – Zn, Fe, Mn and Cu
- (iii) Available soil nutrients either after the harvest of each crop or completion of each crop cycle at the depth of 0-15 cm in respect of the following characters:
  - E.C., pH, O.C. and Bulk Density.
  - Available N, P, K, Ca, Mg, S, Zn, Fe, Mn and Cu
- (iv) Weekly Weather Data: total rainfall, number of rainy days, maximum and minimum temperature, humidity and wind velocity etc.

**2. SYSTEM ARCHITECTURE AND REQUIREMENTS**

This search system has been designed with a layered structure wherein each layer corresponds to a particular functionality.

The design of information search (Fig. 1) is made up of three layers viz. User Interface layer (UIL), Application layer (APL) and Database layer (DBL).



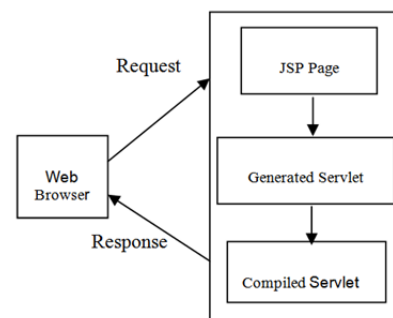
**Fig. 1: Three Tier Architecture of Search System**

**User Interface layer (UIL)**

The User Interface Layer of the system is implemented using HTML (Hyper Text Markup Language) and JavaScript. The UIL consists of forms for accepting information from the user and validating those forms using JavaScript.

**Application Layer (APL)**

Server Side Application Layer is implemented using Java Server Pages™ (JSP). This technology generates HTML pages according to the user's action and request. Fig. 2 shows one of the most common ways of using JSP.



**Fig. 2: Building Web Pages with Java Server Pages**

**Database Layer (DBL)**

Database Layer of the system is implemented using Microsoft Access 2000. It is used for designing the Tables, Relationships, Referential Integrity Rules and Queries. The relational approach has been used to design the database. The

fundamentals of Normalization theory have been used to normalize the different tables of the database [Loney (2004)]. All tables have proper interaction among themselves via primary key - foreign key relationship. Search system on LTFE is developed as a web-based application. Only requirement at the client side is web browser in order to access the application.

### 3. FUNCTIONALITIES OF SEARCH SYSTEM

Search System is web-based, user-friendly and integrated system. Fig. 3 shows the home page of the system.



Fig. 3: Home Page of Software

#### 3.1 Type of Users

There are normally three types of users for the system.

- (i) **Administrators:** are the users who manage the system and them therefore have the right to add, modify, delete or update any part of the information captured in the database. This operation is shown in the Fig. (Fig. 4) and Fig. (Fig. 5).



Fig. 4: Operation of Administrator

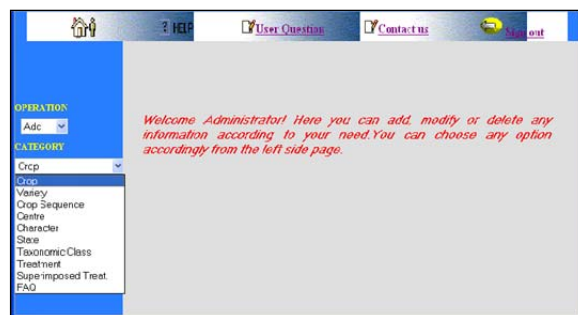


Fig. 5: Operation of Administrator

- (ii) **Nodal Administrator:** are the users who manage the system and them therefore have the right to add, modify or update any part of the information captured in the database at particular centre. This operation is shown in the following Fig. (Fig. 6 and 7).

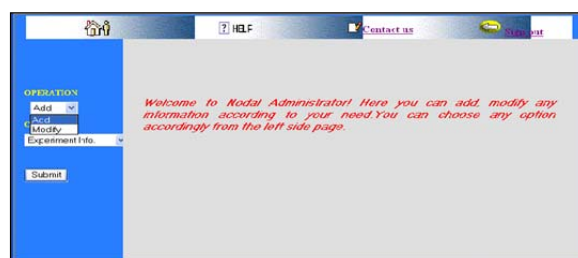


Fig. 6: Operation of Nodal Administrator

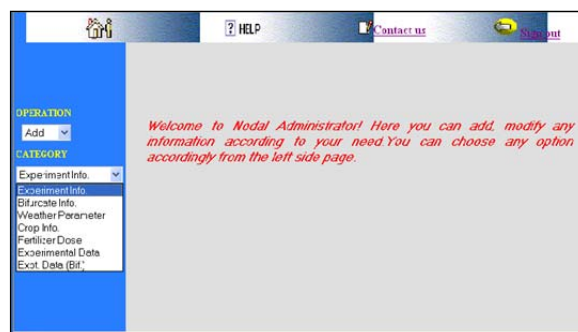


Fig. 7: Operation of Nodal Administrator

- (iii) **End Users:** are the persons who can retrieve information from the system. They can view the frequently asked questions to quench their queries or send e-mail to concerned developers and get the satisfactory answers.

### 4. SEARCHING INFORMATION

User can retrieve information from this system through searching. Users can select any topic according to their needs. The search page is shown in Fig. 8. They can search Centre Information, Experiment Information, Bifurcate Information,

Weather Parameters, Crop Information, Fertilizer Dose, Experimental Data, Experimental Data With Bifurcated Treatments.

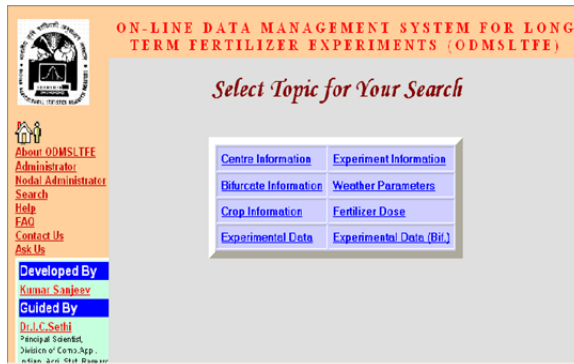


Fig. 8: Search by Topic

#### 4.1. Data Information

The end products of any system are its outputs. System analysis and design concentrates primarily on the outputs of a system. The most important things are its data. The searched data are shown in Fig. 9, 10, 11.

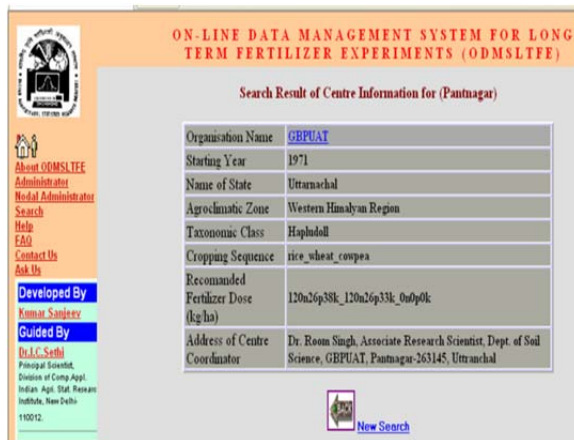


Fig. 9. Centre Information

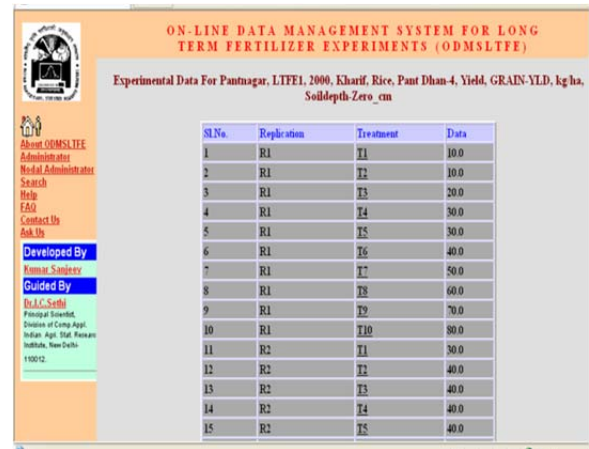


Fig. 10. Experimental Data



Fig. 11: Experimental Data with Bifurcated Treatments

### 5. INFORMATION USEFUL FOR DECISION PLANNING IN PERSPECTIVE OF CLIMATE CHANGE

- Centralized system is required for day by day growing data of agricultural research.
- Data Information is useful for planners, policy makers, researchers and development agencies etc. for decision.
- Planning, Designing and Statistical analysis of data relating to experiments conducted under the AICRP on LTFE.
- The decision support system can be developed that will include treatment input parameters.
- This system will provide intellectual support to users in proper application of fertilizers to the crops.

## 6. ACKNOWLEDGEMENTS

I am indebted to Dr. M. R. Vats, project investigator of Long Term Fertilizer Experiments (LTFE), IASRI, Pusa, New Delhi for his special interest and valuable suggestions regarding the present work.

## REFERENCES

- [1] Date, C.J., *An Introduction to Database Systems*, Addison-Wesley/ Narosa, New Delhi, 1998.
- [2] Das, S., Kumar, B. and Malhotra, P.K., "Online Pest Management Information System", *Journal of the Indian Society of Agricultural Statistics*, 55, 2, August 2002, pp. **184-188**.
- [3] <http://www.jakarta.apache.org>
- [4] <http://www.java.sun.com>
- [5] <http://www.microsoft.com>
- [6] Kumar, S., *Development of a Computerized Management Information System for Research-Farms*, I.A.R.I., New Delhi, M.Sc.Thesis, 1995.
- [7] Pekowsky, L., *Java Server Pages*, Addison-Wesley, USA, 2000.
- [8] Prashant, P., *Development of Pest Management Information System on Tomato*, I.A.R.I., New Delhi, M.Sc.Thesis, 2000.
- [9] Vats, M.R., Sehgal, D.K., and Mehta, D.K., *Planning, Designing and Statistical analysis of data relating to experiments conducted under the AICRP on LTFE*, IASRI, New Delhi, Project Report, 2001.