1. Introduction

Agricultural modernization is one of the vital keys towards economic growth of the country. With development of agriculture over the years, it has become more complex and sophisticated. Research support is a necessary pre-requisite for planning and development of agriculture and allied disciplines. For increasing the crop productivity and for crop diversification / intensification etc., a large number of agricultural experiments are being conducted in the country. For realizing full benefits of efforts and resources spent on agricultural research, it is essential to ensure readily availability of results obtained from agricultural experiments to the concerned agencies in a compatible form. The documented research data not only assists a scientist in drawing a program of investigation but also helps in knowing the extent of work done in the past, the approaches followed and the type of results obtained by other scientists in the field. It helps a planner in building reliable estimates of yardsticks of additional production for the various inputs on sound footing. It helps administrators and extension workers to take the proven results from the lab to land for adoption by farmers.

In agriculture and natural resources research and development, the role of research managers is as crucial as the role and value of information. With the management’s task of decision-making and problem-solving, their quality and effectiveness are affected by the accuracy, sufficiency, and timeliness of information. And since problems in any field - including agriculture - are best understood as one of the basic endeavor of information processing, an appropriate availability of information through some information system is desirable.

Agriculture Field Experiments Information System (AFEIS) is such an initiative of Indian Agricultural Statistics Research Institute (IASRI) which has its roots in its erstwhile all India scheme namely National Index of Field Experiments (NIFE) initiated in the year 1955. NIFE was started at the recommendations of FAO experts with the objective of collecting and systematically maintaining, at a central place, the experimental data of agricultural field experiments (excluding purely varietals trials) conducted in the country at various research centers under the aegis of Agricultural Universities, Central Institutes, All-India Coordinated Crop Improvement and other Coordinated Research projects of ICAR etc. Keeping in view the developments in information technology, the scheme was reorganized to a computer based information system and renamed as Agricultural Field Experiments Information System (AFEIS). This operates at two levels - (I) Regional Centers and (II) Head Quarters. Regional centers are located at different Agricultural Universities/State Department of Agriculture and are responsible for the collection of experimental data from research stations falling within their jurisdiction. The headquarters, located at IASRI, is responsible for validation of data, conversion of data in physical form to electronic form, creation, implementation and maintenance of database of collected agricultural experiments. The database developed under
the system now contains details of more than 21,000 experiments conducted at different research stations of the country.

The software for the system was developed earlier on MS-DOS platform as a standalone system. With the fast growth and en-mass dependence on Internet, we have developed software for making the information collection, storage and retrieval on-line by making suitable changes in the structure of the existing database as well as the software by using new technologies such as HTML, JavaScript, JSP and SQL server. The objective is to gear the present AFEIS to address to the new needs of users and to respond to the new production environment by taking advantage of new technologies through computers and databases. The goal is to provide reliable and timely information on various types of agricultural experiments conducted in the country.

Recently at IASRI, under AP Cess fund Projects of ICAR, we have developed two more information system namely

1. National Information System on Long term Fertilizer Experiments
2. National Information System for Animal Experiments

In the present note, we have given the complete details AFEIS whereas data structure and report modules have been given for NISLTFE and NISAE.

2. Objectives

One of the main objectives of this system is to create and maintain a computerized information system that manages agricultural field experiments data efficiently. Data is to be processed to generate agricultural information. This involves the operational aspect of collecting the data, inputting data into the system, storing, processing, retrieving as also maintaining the system by updating and deleting obsolete and redundant data.

The major weaknesses identified in agricultural experimental data collection that inspired for development of this web-based information system are:

An inadequate flow of agricultural data / information to users. It is observed that generally data is collected, processed and stored in different physical locations and is poorly disseminated. Data is usually retained at the level of each physical entity for organizational use. This system has been aimed at addressing this urgent need by establishing a single, centralized data storage and retrieval system with fast access for agricultural field experimental data generated in the country.

Adequate analysis of agricultural field experiments and interpretation of results over time and space seems to be lacking to effectively use it for agricultural policy planning and other purposes. Lack of training in the utilization of available statistics for decision making has been identified as a major loophole. Development of this system will help the agricultural research workers and planners to a great extant in this direction.
3. System Overview
The Agricultural Field Experiments Information System (AFEIS) at IASRI is an enterprise information system that aims at providing efficient and accurate access to the latest information about experimentation in the field of Agricultural Sciences.

A basic requirement for proper functioning of an Agricultural Field Experiments Information System is the systematic maintenance of data of experiments, undertaken on various disciplines of agricultural technology, at a central place.

4. The system should provide procedures for:
   - Data Collection
   - Data Validation
   - Data Processing
   - Information Generation

4.1 Data Collection
Agricultural field experiments conducted at numerous research stations under the aegis of different organizations like ICAR institutes, Agricultural Universities etc in the country form the basis for generation of data in the database. The data regarding plot-wise response and/or results in respect of character under investigation along with ancillary information like objectives, treatments tried, basal conditions, general information relevant to the experimental period and statistical design adopted in respect of the experiments is being collected from the above agencies. The collection of the conducted experiments forms the key to enrich the database of the system. The present system to collect the experimental data is through the personal visits of the regional staff of the project working under the supervision of regional supervisor located in different parts of the country. The on-line entry forms to be used for collecting the data have been presented later.

The data being collected by the technical personnel of Indian Agricultural Statistics Research Institute (IASRI) is first recorded on printed forms devised to suit the database structure of the information system. Next, in the past, it used to be first got punched on to cards or saved on floppies by the key punching staff followed by repeated comparisons of listings as part of validation of data before being transferred to the information system. This not only led to delay but also took more man hours.

In the new web-based information system, once the data is recorded on the data entry forms, data can straight away be entered into the database through on-line data entry forms. The data entry forms, though can not check for validation in its entirety, still it undertakes several validation checks through the code written in JavaScript before submitting the data to the database that might reside on the server located at some remote place. The database finally performs rest of the validation checks that are not possible at client side, before accepting the data in the database. The new system of data entry is expected to decrease the time lag between conduct of the experiment and its inclusion in the database.

For each experiment, the information has been stored into eight divisions. These divisions are: (i) Identification (ii) Objective (iii) Basal Conditions (iv) Treatments (v) Design (vi) General Information (vii) Plot-wise data and (viii) Results. Results have, however, been stored in two
parts – (1) Summary of results that includes General Mean, Standard Error, Critical Difference, Significance of various effects, Means of Control/Extra treatments, if any, tried in the experiment etc and (2) Means of the treatments/two-way mean tables for various factors tried in the experiment. Analyzed results of the experiments are mainly available in cases where plot-wise data is not available. Efforts to analyze and store the results of statistical analysis of all available experiments are also in progress. Nine data preparation forms corresponding to nine data divisions of the database have been developed for on-line data entry of each experiment.

**Identification division:** The form for identification contains several parameters, mostly consisting of codes used as foreign keys and based on tables for States, Research stations, Crops, Seasons, Soil types, Soil textures, Designs, Total treatments, Number of replications, Factors tried etc. The primary key for this table has been created by concatenating State ID, Year and Reference number which is based on serial number of the experiment reported from a particular state in a given year. Identification table shall play most important role in retrieval of experiments as most of the user queries would be based on this table alone. This table would facilitate the user to custom create a query based on one or more parameters from almost all parameters of this table. The form for data entry into identification division is as follows:
**Objective division** contains information on objective of the experiments and the form for entering this information is through the form presented below:

**Basal Conditions** division contains information on history of experimental site that includes crop rotation, previous crop, manure to previous crop, date(s)/period of sowing / planting, preparatory cultivation, method of sowing, seed rate, number of seedling/hole, spacing, basal manure, variety, post sowing operation(s), rainfall and date(s) / period of harvest. This information can be entered into the system by using the form presented below:
Treatments division contains information details of treatments applied in the experiment. This information can be entered into the system through the form presented below:

Design division contains information on number of plots per block, block dimension, gross plot size, net plot size and border row/guard size. This can be entered into the system through the form presented below:
General information division contains disease/pest attack details, duration of experiment, whether treatments were applied on same plots, reference to combined analysis, center(s) where experiment was conducted, abnormal occurrences. This information can be entered into the system through the form presented below:

Raw data division contains replication-wise plot data in respect of the experiment. In case the experiment is analyzed, the form that allows entry of results in the information system is presented instead of raw data. For experiments having raw data as well as results, first the
form for entry of raw data is presented and then the form for entry of results follows. The form for entry of raw data is presented below:

On submit of raw data for un-analyzed experiment or results for analyzed experiment, we are prompted with the following page through which the user can select main menu to confirm for him the entry of the experiment.
4.2 Data Validation
In order to arrive at perfect accuracy of data in the database, efforts have been made by incorporating several validation modules which check for the validity of the data at three stages.

- First, at the time of data entry before submitting the data into the database
- Secondly, at the time of accepting the data into the database residing on the server and
- Lastly, by manual validation to correct the discrepancies and inconsistencies that are not possible to be traced and handled by the software.

4.3 Data Processing
In the data processing part of AFEIS, the system takes care of:

- processing of queries triggered by the users as well as
- provision of suitable statistical analysis with interpretation of results.

4.4 Information Generation
In this part, the information system dynamically generates different reports based on the data retrieved from the database through user created queries as well as through some pre-defined queries.

4.4.1 Accessing the System
AFEIS provides service to four kinds of users viz, (1) Unregistered User (2) Registered End User (3) Administrator and (4) Super Administrator. An Unregistered user can basically get a feel of the information system and can view certain reports but has to get registered with the system in order to query experiments of his choice as well as to reach the details of the selected experiments. A registered end user can only view the information. This user has, however, the option to create a query of his choice based on selection of different parameters of the experiments. Administrator, on the other hand, is a user who has all facilities that a registered end user possesses but has an additional privilege of editing the data. Super administrator is the user who has all the privileges as are enjoyed by an administrator but has got an additional privilege of upgrading a user from registered end user privileges to administrator or downgrading a user with administrator privileges to registered end user.

The database would be available on-line for use by the users. Facilities available in this version include search on selection of one or combination of the following parameters:

- Agro-Climatic zone
- Crop Group
- Crop
- State
- Research Station
- Type of Experiment
- Soil Type
- Soil Texture
- Year
- Season
- Irrigation Type
- One / Two / Three specific factor(s)
On selecting the parameter(s), the system provides a list of all the experiments which satisfies the query submitted by the user. This list mentions Year, Research Station, Objective, Experiment type along with a link called View Details (Full/Part). On clicking View Details (Full), we get details of all the divisions in respect of the selected experiment whereas View Details (Parts), gives a form that allows us to select the divisions of interest to us. Submitting of selection of various divisions provides detailed information on selected divisions.

### 4.4.2 Query building

On clicking main menu, we get the following form that allows the user to build a query of his choice. The user may select from one or more of the following parameters.

<table>
<thead>
<tr>
<th>Search Experiment with:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note: User can select one or more of the following fields.</td>
</tr>
<tr>
<td><strong>Field</strong></td>
</tr>
<tr>
<td>Year</td>
</tr>
<tr>
<td>Research Station</td>
</tr>
<tr>
<td>Objective</td>
</tr>
<tr>
<td>Experiment type</td>
</tr>
<tr>
<td><strong>Field</strong></td>
</tr>
</tbody>
</table>

The query submitted in the above form gives the output as:

<table>
<thead>
<tr>
<th>Objective - wise report of experiments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
</tr>
<tr>
<td>A/B/C...</td>
</tr>
</tbody>
</table>

The query submitted in the above form gives the output as:
On clicking full, we get the detailed information in respect of the experiment:

<table>
<thead>
<tr>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>To test the efficiency of various design formulations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-doses: 30</td>
</tr>
<tr>
<td>0.00, 10.00, 20.00, 30.00, 40.00, 50.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Base conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop</td>
</tr>
<tr>
<td>Variety</td>
</tr>
<tr>
<td>Planting rate</td>
</tr>
<tr>
<td>Method of planting</td>
</tr>
<tr>
<td>Fertilizer</td>
</tr>
<tr>
<td>Soil type</td>
</tr>
<tr>
<td>Soil texture</td>
</tr>
<tr>
<td>Soil reaction</td>
</tr>
</tbody>
</table>

We shall now discuss briefly the National Information System on Animal Experiments and National Information System on Long Term Fertilizer Experiments developed by the Institute.

5. National Information System on Animal Experiments
The NISAE gives the details of experiments conducted in the country in the field of Animal Sciences.
5.1 Sources and Data Availability
The experiments in various disciplines of animal sciences are being undertaken at various ICAR institutes dealing with Animal Sciences, Agricultural/Veterinary Universities, etc. The key source of information under the project has been the annual reports published by these organizations. From these reports it is seen that research in NARS is conducted through formation of projects and sub-projects with experiments planned under these projects/sub-projects. At present we are in the process of obtaining the information on 722 projects classified in 23 disciplines, undertaken at twenty one research organizations during the period 1997-2002. (Annexure-1)

5.2 Software Development
Keeping in view the information available, the database structure has been developed using RDBMS principles. The information of the experiment has been divided into following data items:
   I. Title
   II. Names of investigators
   III. Subject
   IV. Source
   V. Research station
   VI. Species
   VII. Breed
   VIII. Period of experiment
   IX. Year of conduct
   X. Funding agency
   XI. Salient results achieved

5.3 Designing and Development of NISAE
NISAE is based on three-tier (layers) architecture as described earlier for AFEIS. The upper layer depends upon database design. Database used for the development of NISAE has been structured using Microsoft Access 2000. The tables with their respective content fields and other specifications are designed using the relational database approach and proper normalization.

5.4 Designing of Tables
SQL server 2000 has been used to provide database tables in NISAE. The description of database tables used is given below.
List of tables in the database

<table>
<thead>
<tr>
<th>Name of Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breed</td>
<td>List different species and their breeds</td>
</tr>
<tr>
<td>Research Station</td>
<td>List names of different research organizations in India conducting research in Animal Sciences</td>
</tr>
<tr>
<td>Project Type</td>
<td>List different types of projects</td>
</tr>
<tr>
<td>Species</td>
<td>List different species of animals</td>
</tr>
<tr>
<td>Sponsoring Agencies</td>
<td>List names of sponsoring agencies</td>
</tr>
<tr>
<td>State</td>
<td>List names of states of Indian Union</td>
</tr>
<tr>
<td>Subject</td>
<td>List different disciplines of Animal Sciences under which research is carried out</td>
</tr>
<tr>
<td>User</td>
<td>List names of users who are accessing the system</td>
</tr>
<tr>
<td>Use Type</td>
<td>List different types of users like Administrator, End user and Special users.</td>
</tr>
<tr>
<td>Salient results project</td>
<td>List projects undertaken at various research stations</td>
</tr>
<tr>
<td>Salient result sub-project</td>
<td>List sub-projects under various projects</td>
</tr>
<tr>
<td>Salient results experiment.</td>
<td>List experiments with in the projects and sub-projects</td>
</tr>
<tr>
<td>Salient results experiment-ext.</td>
<td>List salient results of an experiment – year wise</td>
</tr>
</tbody>
</table>

All tables in this database contain their respective attributes, primary keys and in some cases foreign keys for setting the relationship among the tables.

5.5 ER-Diagram

The E-R diagram shows all the relationships between tables in the database. The master table Salient Results Experiment_ext is related to other tables through different types of relationships and referential integrity. Salient Results Experiment_ext contains all the relevant data for the information system.
5.6. Designing and Development of User interface
The user interface has been developed using HTML, Java and Java Script embedded in Java server pages according to the design discussed earlier. Home page is the first page to be displayed which contains a link to the log-in page. The home page allows the login of existing users as well as provides facility for opening accounts for new users. For new user the authentication level (3) is automatically generated. The log-in page verifies user's validity i.e. his log-in name, password and authentication level. In case of Invalid User, an error page is generated giving the details of invalidity. When a user successfully logs on to NISAE as an end user the relevant pages are loaded on browser.

The broad classifications of authentication levels are 1, 2 and 3 viz. super user/administrator, intermediate user and ordinary users. When the user authentication level is 1 or 2 he is displayed with a menu bar with administrator privilege like adding or editing the data, where as in authentication level (3) only retrieval / search facility is made available. The user can generate the query pertaining to a specific research station, subject, specie, breed and investigator name to obtain the desired information. With an authentication level (1) administrator can upgrade or downgrade the levels of other users.

Home page also Links to other Sites, like IASRI, ICAR. It also gives information about ‘NISAE’ and its ‘Objectives’, ‘Contact us’, ‘Names of participating Institutes’.
A large number of long term fertilizer experiments on various Food, Horticulture and Commercial Crops are being conducted at different ICAR Institutes and various SAUs. Usually the information generated from these experiments is not available in compatible form at one place to the scientific community working in National Agricultural Research System (NARS). Planners/ Research workers may be interested in this information because this will help them in the planning/conducting the future long term experiments. Moreover, this information will also be helpful in carrying out the mid-course modifications, without affecting the long-term continuity and integrity of the on-going experiments for studying the new emerging research problems therein.

Keeping this in view National Information System on Long Term Fertilizer Experiments (NISLTFE) was created with the following objectives:

(i) To collect, collate and compile the data on long term fertilizer experiments
(ii) To design and develop a database for long term fertilizer experiments
(iii) To develop a user-friendly web-based information system on long-term fertilizer experiments.
(iv) To evolve suitable mechanism for maintenance, inflow and updating of the information system.

6.1 Source of Information and Quantum of Data
The key source of data information for NISLTFE is the data generated under long term fertilizer experiments conducted/ in progress at various organizations under different divisions of ICAR. For this linkages with organizations engaged in LTFE were established to acquire the experimental information available on various aspects of agro technologies since their initiation. About 25 scientists at these locations were nominated as Nodal Officers by their respective Heads of Institutions for supplying the necessary information and data for NISLTFE. So far a maximum number of 59 experiments under NRM followed by 11 and 4 experiments under Crop Sciences and Horticulture divisions have been identified for entering their data under the system. These numbers would go on changing whenever the information from new experiments is received.

6.2 System Architecture and Database Design
The information system has been designed as user friendly and can be used by individuals having no knowledge of computer based information systems or any of the computer software. It has been developed as a web based information system on long term fertilizer experiments conducted in India. The overall purpose of the system is to store, maintain and retrieve the information online.

6.3 Database Design and Development
The database of National Information System on Long Term Fertilizer Experiments has been implemented using SQL server 2000. The spectrum of the database comprises of database tables on different entities of Long Term Fertilizer Experiments and the fields of the tables cover details of all attributes of the concerned experiment. A primary key in each table is identified for uniquely defining a record. Similarly the Foreign keys are identified from other tables for setting relationship amongst the different entities.
6.4 Designing of Tables

SQL Server 2000 has been used to design database tables with rows and columns to store data where each column represents a field and each row a record. The records under each field within different information tables are to be filled by the user on line through various forms under Data Management Module. Besides the above database tables which have been used in the system for storing experiment related information, 29 Master tables have also been designed. The data stored in these master tables can be used at various places while entering or updating the data related to an experiment.

**ER-Diagram** showing relationships amongst the tables of database are given below:

![ER-Diagram](image)

6.5 Designing and Development of user Interface

The user interface of NISLTFE has been designed to cater to various needs of different types of users. It is a user friendly interface that provides various options and directions to accomplish various tasks. The user interface has been divided amongst the static and the dynamic parts based on the way the information is provided to the user. The system provides a login form as a security barrier before entering into any of the modules. Only the authorized users (System Administrators/Nodal Officers) of the system can enter into the modules after entering their user Id and password.
6.6 Static Part of Interface
The static part provides the information in the form of HTML pages (they don’t have any link with the database). The static information is present on the Home page (given below) under the following menus.

- **Introduction**
  It gives information about the Long Term Fertilizer Experiments as well as on National Information System on Long Term Fertilizer Experiments.

- **Contact Us**
  For any queries/assistance regarding the functionality of the site the user can contact the System Administrator at IASRI and for authentication in respect of experiment data retrieval the guest user can contact any of the persons listed in the Contact Us link.

- **Help**
  This module helps the user in operating different modules of the NISLTFE system. For this the user will have to click on the Help menu provided in the Home Page. The contents of this module have been elaborated in the easiest possible manner to accomplish certain tasks in the system.

6.7 Dynamic Part of Interface
The dynamic part of the user interface is entirely linked to the database. It comprises of the following two modules:

6.8 Data Management Module
This module is an important dynamic part of the user interface meant for online data entry/updating through various forms and can be accessed only by the System Administrator and nominated Nodal Officers. No guest user is allowed to enter this module. Under this module four types of online operations can be performed.

1. Master entry/updating under Master Tables in database of the system
2. Addition of New Experiment Information
3. Addition of Subsequent Experiment Information (year/season wise)
4. Updating of Experiment Information already stored
The System Administrator can perform all of the above four operations, whereas nominated Nodal Officers having authenticated passwords can operate the last three options for their respective centers only. The deletion option has not been provided since the experiments are of continuing nature. However, if some mistakes occur while entering the data the same can be rectified using the updating option. Moreover, the permanent deletion of any data can only be done by the System Administrator only.

The online data entry and updating tasks for experiment related information is done through the following forms viz.

- Experiment id information form containing the names of ICAR Division, Organization Type, Centre and the Site of the experiment
- Centre information form consisting of its ecosystem, eco-region, eco-sub-region soil taxonomy, longitude, latitude and altitude
- Experiment Principal Investigator information form regarding its name, designation, postal address, email id, telephone and fax numbers.
- Experiment general information form about title, objectives, year of start/termination, statistical design, field layout plan, plot size etc.
- Crop related information form like variety, standard week of sowing/harvesting, plant spacing, crop condition/damage etc.
- Treatment details information form involving input doses, sources, methods of application and treatment deviations etc.
- Data value information form containing plot wise/mean data for different characters
- Mid course modification information form regarding changes carried out in the ongoing experiment
- Superimposed treatments data value form for each character
- Weekly weather data information form and
- Information form relating to new user like creating password, electronic/surface mail, telephone and fax numbers of new user

For illustration an experiment id form (one of the aforementioned forms) duly filled is shown below:
6.9 Reports Module

The Reports module handles the information retrieval tasks from the database and its display to the user. The reports are both of fixed and user-customized type. Different types of users would be able to generate reports of their own interest in a proper and structured manner. However, the Guest User would not be allowed to view character wise experiment data value reports. For this the guest user will have to secure an id and password from any of the persons under Contact Us module. The reports option form provides the user with various options for generating different types of reports viz.

- Experiment General Information Reports
- Experiment Crop Information Reports
- Experiment Information (Agro-Eco System-wise)
- Experiment Information (ICAR Division-wise)
- Experiment Weather Information Reports
- Experiment Character Data Value Reports
- Mid-course modification information and Super-imposed treatments Data Value Reports
- Experiments Field Layout Plan Reports

The help menu guides the user in generating the required reports. One of the reports generated for data value of a long term experiment conducted with RCBD design at Ludhiana centre has been illustrated below:

<table>
<thead>
<tr>
<th>Centre Name: Ludhiana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title of Experiment: To study changes in soil quality-crop productivity and sustainability</td>
</tr>
<tr>
<td>Source: Winter</td>
</tr>
<tr>
<td>Crop Name: Wheat</td>
</tr>
<tr>
<td>Crop Stage: Harvest</td>
</tr>
<tr>
<td>Character Category: Yield</td>
</tr>
<tr>
<td>Seed Depth: Not Applicable</td>
</tr>
<tr>
<td>Year From: 1964-65 To 1974-75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Year</th>
<th>Character Name</th>
<th>Treat Sr. No</th>
<th>Rep. No</th>
<th>Replication Wise Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1971-72</td>
<td>Grain Yield(ha)</td>
<td>1</td>
<td>1</td>
<td>27.7</td>
</tr>
<tr>
<td>2</td>
<td>1971-72</td>
<td>Grain Yield(ha)</td>
<td>1</td>
<td>2</td>
<td>26.4</td>
</tr>
<tr>
<td>3</td>
<td>1971-72</td>
<td>Grain Yield(ha)</td>
<td>1</td>
<td>3</td>
<td>24.9</td>
</tr>
<tr>
<td>4</td>
<td>1971-72</td>
<td>Grain Yield(ha)</td>
<td>1</td>
<td>4</td>
<td>24.2</td>
</tr>
</tbody>
</table>
The generated report can be saved with an .xls extension in Excel and can be utilized for further analysis with any of the software packages.

7. Conclusions
The system will help scientists/experimenters and their advisors facilitate planning, controlling, monitoring, steps for corrective actions, auditing, and review activities to ensure both that the agricultural policy is complied with and that the agriculture management system remains appropriate. With its vast amount of information, this product can successfully provide access to sound, science-based information that is the key to implementing good agricultural principles among producers, advisors, and policymakers.