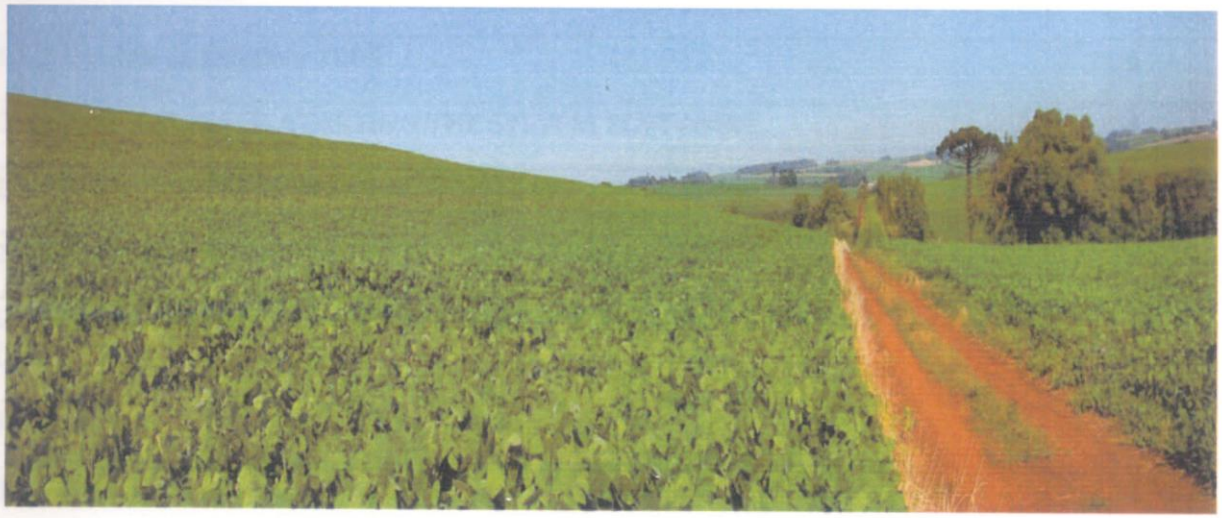
TECHNICAL TRAINING MANUAL

FOR

DATA MANAGEMENT SYSTEM OF AICRPS PLANT BREEDING



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Preface

Soybean is the most important and valuable oilseed crop of the world. India ranks fifth in the area (5.68mha) and production (4.30mt) of soybean in the world after USA, Brazil, Argentina and China. Recognizing the potential of soybean in meeting the present and future needs of the country for vegetable oil and protein rich food, the Indian Council of Agricultural Research (ICAR) launched a multi-location inter-disciplinary All India Coordinated Research Project on Soybean (AICRPS) in 1967. This network project has 7 main centers, 13 sub-centers and 8 need-based centers representing different agro-climatic regions of the country. The co-ordinating unit for the project, Directorate of Soybean Research (DSR), Indore, a constituent of Indian Council of Agricultural Research provides centralized support to the production system research with basic technologies and breeding material of soybean (*Glycine max* L. Merrill). This multidisciplinary and multi-location project has been catering the need of the country with respect to crop improvement, crop production and crop protection aspects. Of the activities envisaged under the project over 70% shares comes from crop improvement program. The experimentation covers five zones namely North Hill, North Plain, North eastern, Central and Southern. Every year, a sizeable data is generated from each cooperative centre and its manual compilation was in vogue. Moreover, it was cumbersome to lay hands on data generated over years. This process of compilation and report generation was time consuming, laborious and is prone to human error.

The drudgery involved in the manual procedure followed every year for AICRPS summary table report preparation, warrants for development of a system which would make summary table report generation more rapid by reducing delays in data input and provide the users with a simple, easy-to-handle, user-friendly method to retrieve accurate and efficient report production for varietal performance decisions to be taken in Annual Workshop of AICRPS.

Initial system was developed using Visual Basic (VB).NET and was partly online. The present system is developed using ASP.NET and is completely web based, linked to the institute website (www.dsrindore.org), using which data-entry is done from different location by the DEOs (Data Entry Operators) and accordingly reports in the form of summary tables are generated .The system also maintains historic data based on which performance analysis is done.

The data management system developed at Directorate of Soybean Research (DSR) for All India Coordinated Research Project on Soybean (AICRPS) experimentation provides routine processing of data and production of summary table reports in easy, efficient and user-friendly manner. It is an on-line data-entry system allowing users the flexibility to enter/edit the data from any place provided they have internet connectivity. This on-line data-entry and management system is developed using and ASP (Active Server Pages) .NET. The database at back end is designed using SQL Server 2005 relational database. The reports are generated in the form of summary tables which is exported to EXCEL worksheets.

Chapter1

INSTALLATION GUIDELINES FOR THE SYSTEM ADMINISTRATORS

Before starting the installation administrators should ensure the system requirements.

1.1 SYSTEM REQUIREMENTS

1.1.1 Software Requirements:-

The computer should have –

1. Windows XP or higher version of professional operating system.
2. MS Office 2000/2003/2007.
3. Microsoft Visual Studio 2010 Professional with Framework 4.0.
4. Microsoft SQL Server 2005.
5. Google Chrome Browser (software works best with this browser and not with Internet Explorer).

1.1.2 *Hardware Requirements:-*

1. Pentium IV with at least 1 GB RAM and 10 GB Hard Disk Space with CD-ROM.

If the system requirements are fulfilled then installation steps as given below is to be followed.

1.2 INSTALLATION STEPS TO BE FOLLOWED

1.2.1 For MS Visual Studio 2010:-

1. Insert the installation CD of MS Visual Studio 2010 in the CD drive.
2. First Install Microsoft .NET Framework 4.
3. Double click the “Setup.exe” file.
4. Click “Next” wherever asked during installation process.
5. Wait until installation is complete.

1.2.2 For MS SQL Server 2005:-

1. Insert the installation CD of MS SQL Server 2005 in the CD drive.
2. First Click SQL Server x86(Upgrade Adviser)
3. Install SQL Server 2005 Upgrade Adviser. Click “Next” wherever asked during installation process.
4. Double click the “Setup.exe” file.
5. Apply all Components to install then click next.
6. Then Apply Install on Local Hard Disk.
7. Use the built in system account-local system or network system.
8. Apply mixed mode (Windows Authentication and SQL Authentication).
9. User Id: sa and choose a Password: dsr123
10. Wait until installation is complete.
11. Check for Microsoft SQL Server 2005 folder in All Programs.
12. If it is available then installation is complete or else re-install the software.

Chapter 2

STEPS FOR STARTING THE SYSTEM SOFTWARE

2.1 AICRPS DATABASE INSTALLATION STEPS

There are 2 ways for database installation-

i) By attaching .mdf files e.g. Aicrps2013.mdf.

a) Copy **.**mdf and **.**ldf files from software cd in a specific location e.g. Data folder in F drive.

b) Open "Microsoft SQL Server Management Studio" by double clicking the icon available on desktop after SQL server installation or go to Start -> All Programs -> Microsoft SQL Server 2005 -> SQL Server Management Studio.

c) Connect to Server Window will appear as shown below in Fig.1.

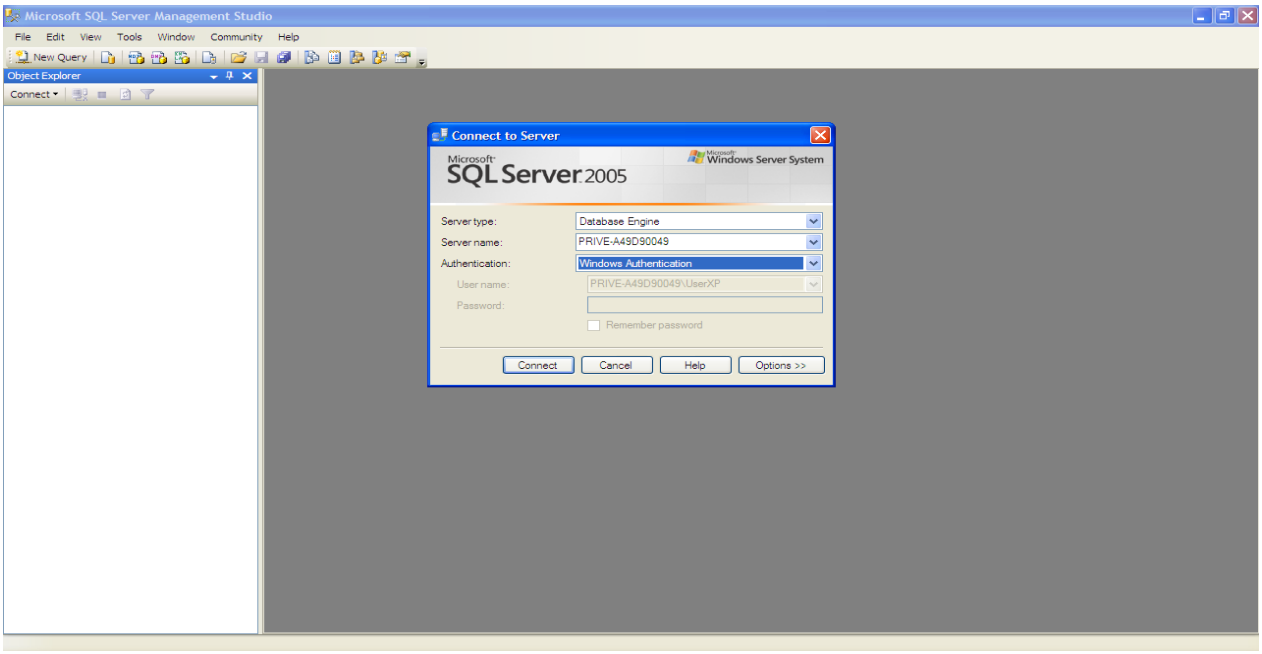


Fig.1 Connect to Server Window

d) Select Authentication as Windows Authentication or SQL Server Authentication (provide User name "sa" and Password as given during MICROSOFT SQL SERVER installation e.g. "start").

e) Press Connect button to open window as shown below in Fig.2.

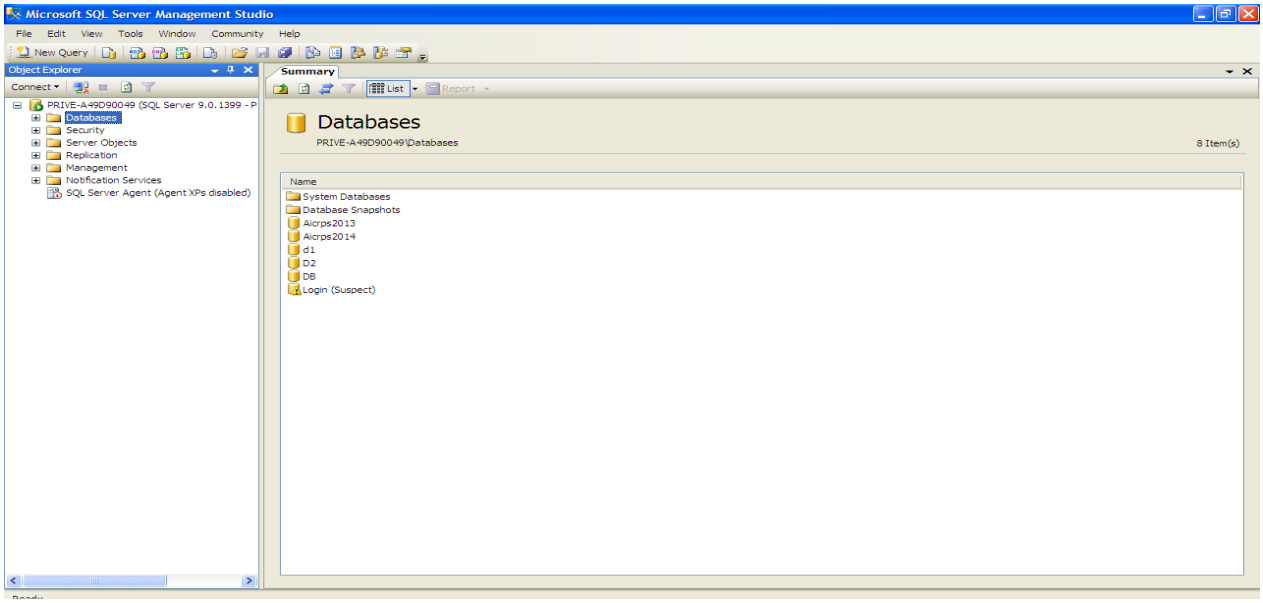


Fig.2

f) Right click on Databases option in Object Explorer panel which appears on left side of the window and select Attach... option as shown below in Fig.3.

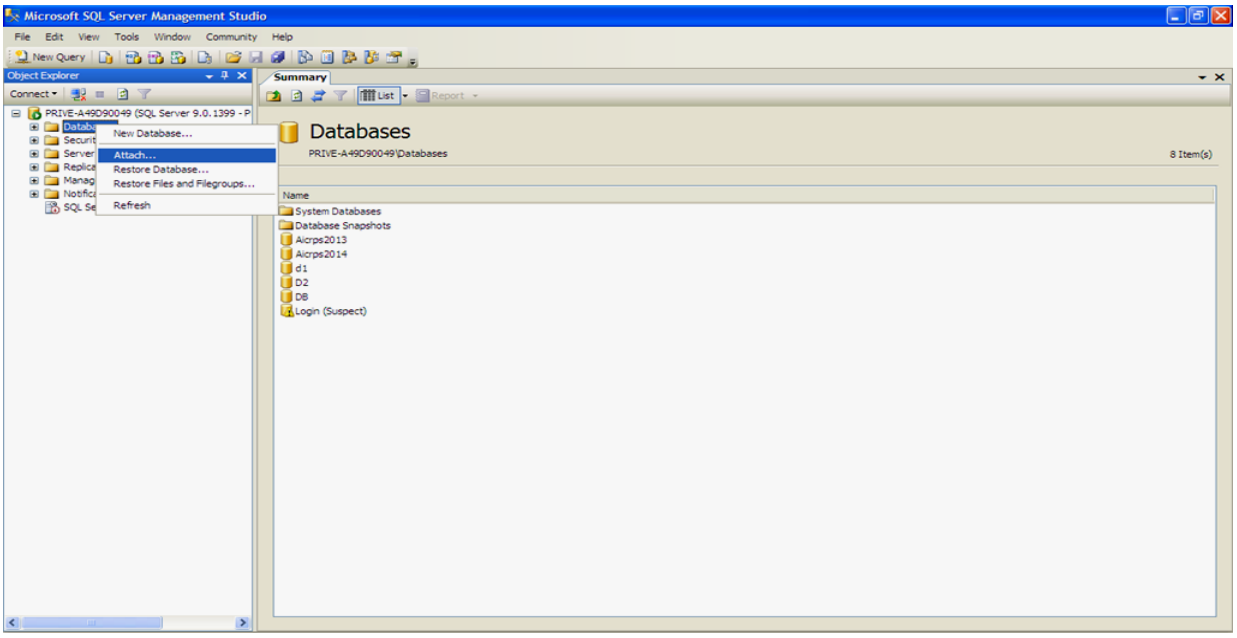


Fig.3

g) Press Add... button in the Attach Databases window as shown below in Fig.4.

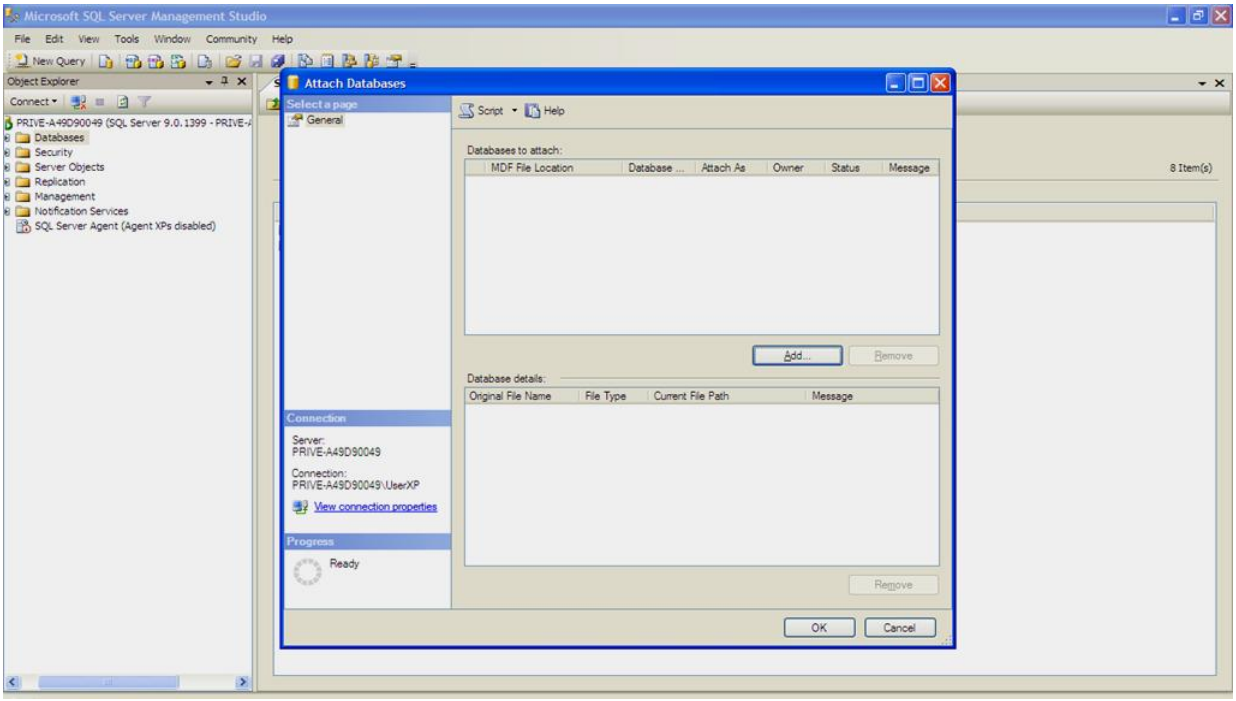


Fig.4 Attach Databases

h) Now browse for .mdf files using 

window as shown below in Fig.5.

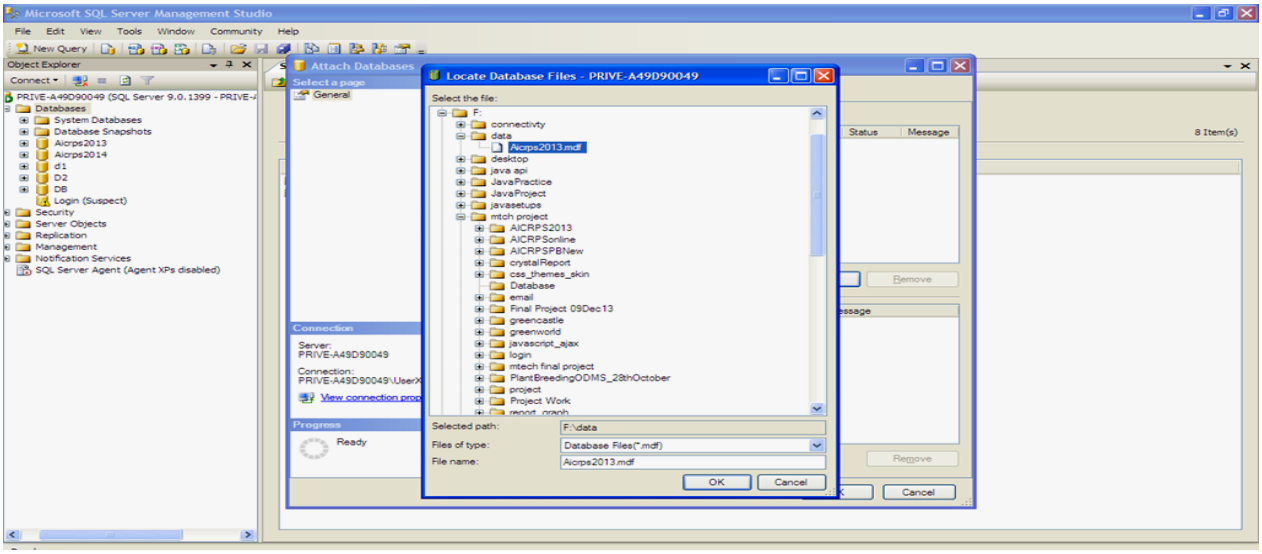
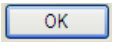


Fig.5 Locate Databases Files

i) Press 

button for final attachment of AICRPS database which will appear in the sub-list of databases in Object explorer panel on left hand side of the window as shown below in Fig.6.

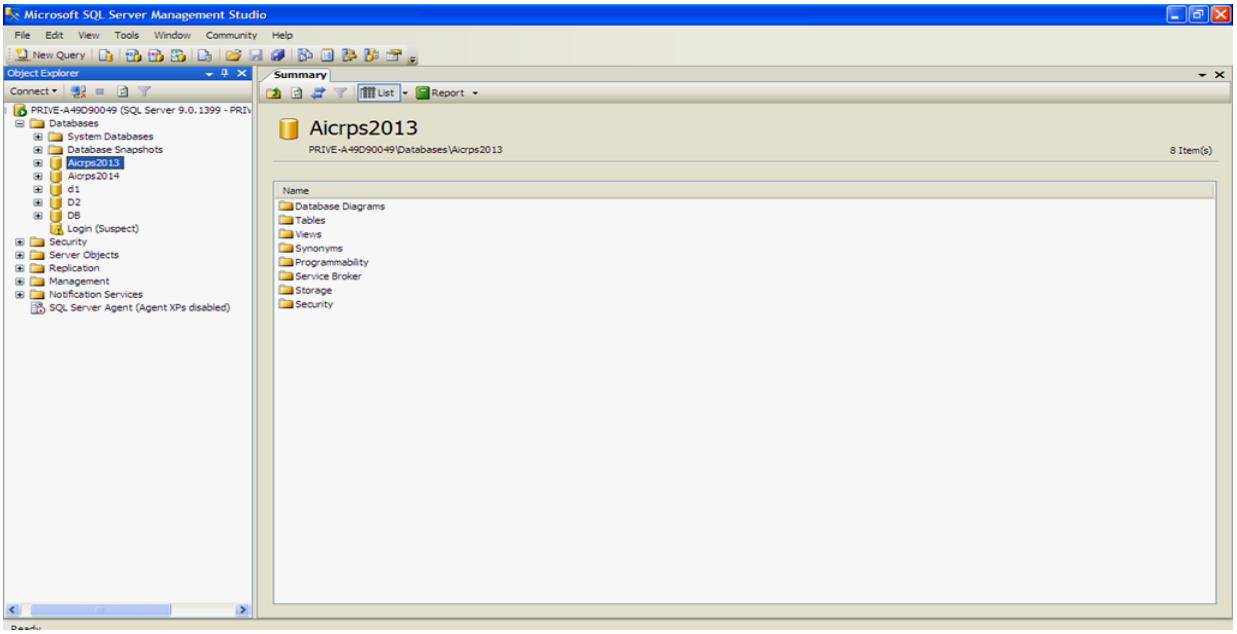


Fig.6

ii) By restoring Backup e.g. Aicrps 2013-14.bak.

a) Copy .bak file in a specific location e.g Aicrps 2013-14.bak in Data folder in F drive.

b) Follow above Steps b to e of 'By attaching .mdf files' to open Microsoft SQL Server.

c) Right click on Databases option in Object Explorer panel which appears on left side of the window and select Restore Database... option as shown below in Fig.7

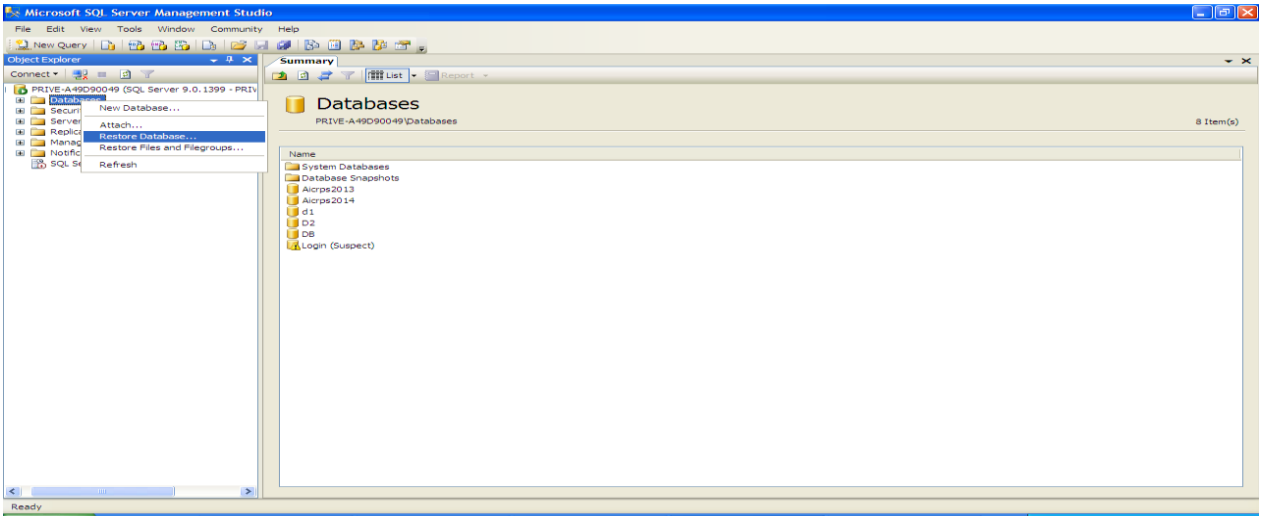


Fig.7

d) Now select or type the name of new or existing database for restore operation in To database: textbox as shown below in Fig.8.

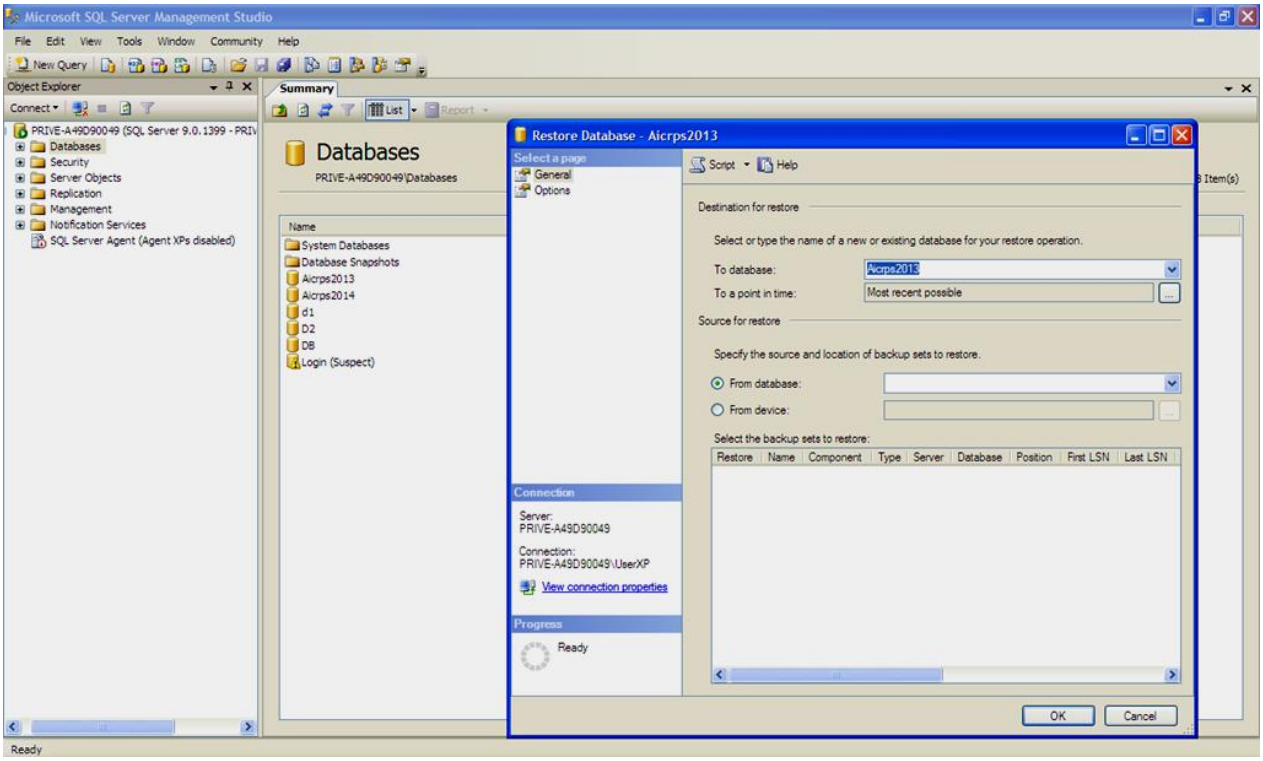


Fig.8

e) Select 'From device' radio button to specify the source and location of backup sets as shown below in Fig.9.

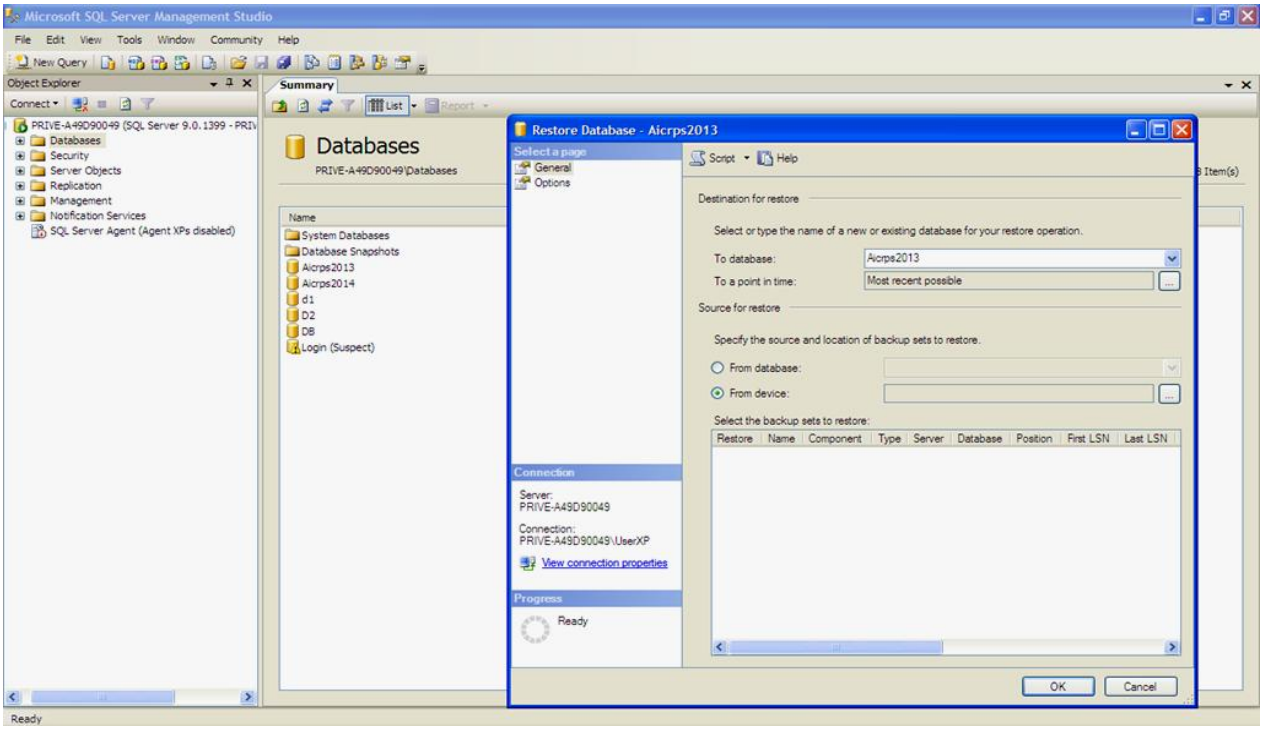


Fig.9

f) Press … button to open "Specify Backup" window as shown below in Fig.10.

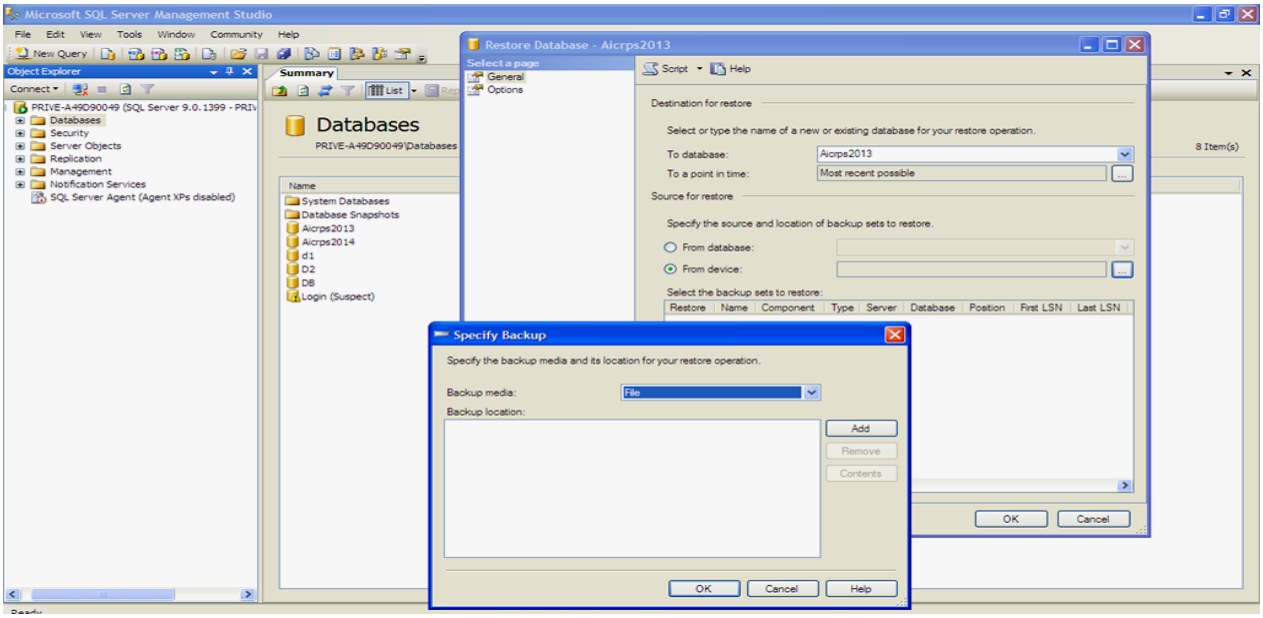
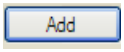


Fig.10 Locate Databases

g) Press  button to browse for .bak file in "Locate Backup File" window as shown below in Fig.11.

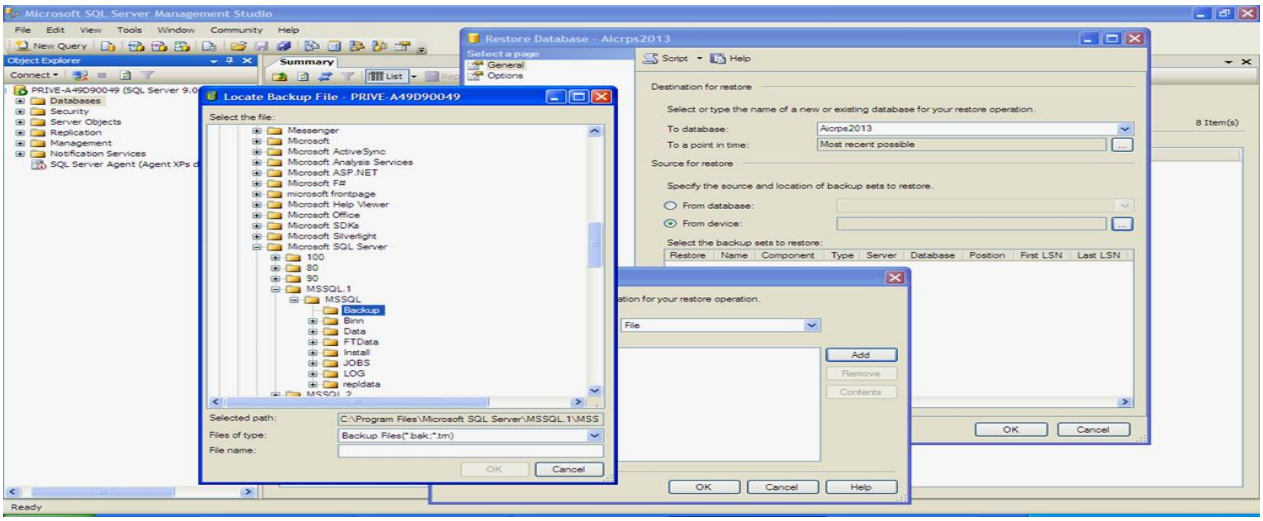
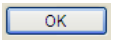


Fig.11 Locate Backup File Window

h) Select desired backup file e.g. Aicrps2013-14.bak and press  button for final restoration as shown below in Fig.12.

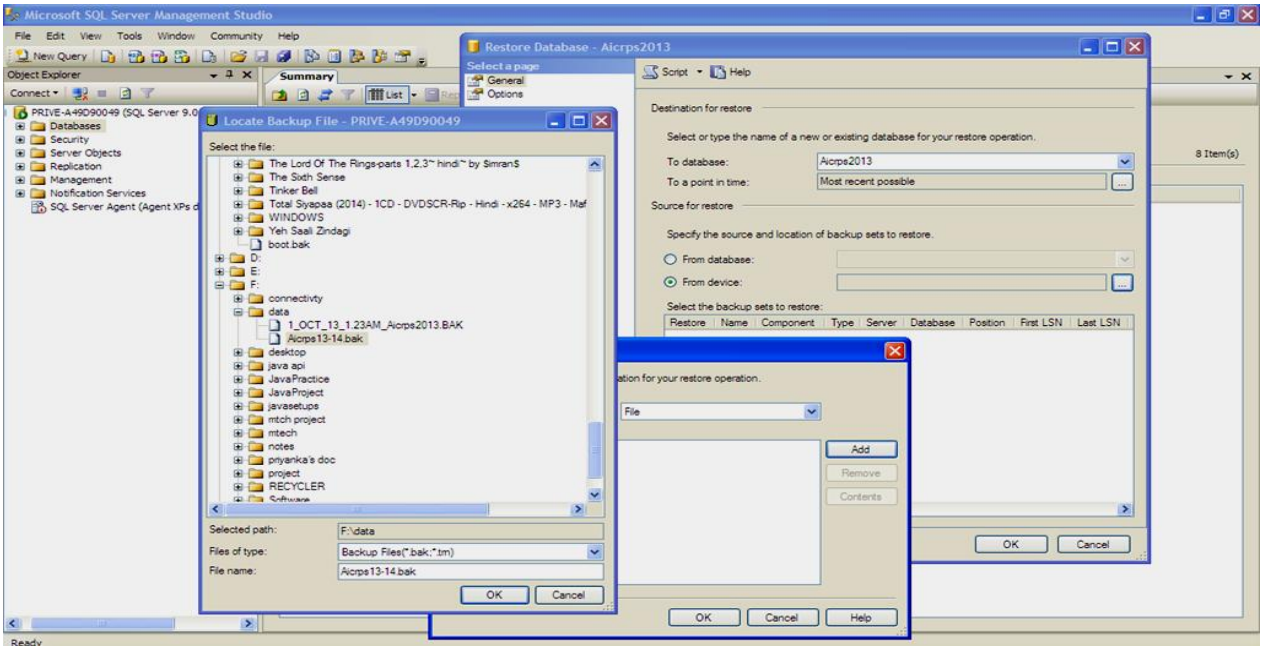
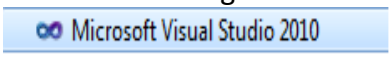


Fig.12

2.2 SOFTWARE INSTALLATION STEPS ON SERVER:-

1. Copy all the contents of the software folder "AICRPSPB" in a specific location e.g. in F drive with the same folder name.

2. Open "Microsoft Visual Studio" by double clicking the icon 

available on desktop after Microsoft Visual Studio installation or go to Start → All Programs → Microsoft Visual Studio 2010 folder → 

.

3. Start window of Microsoft Visual Studio will appear as shown below in Fig.13.

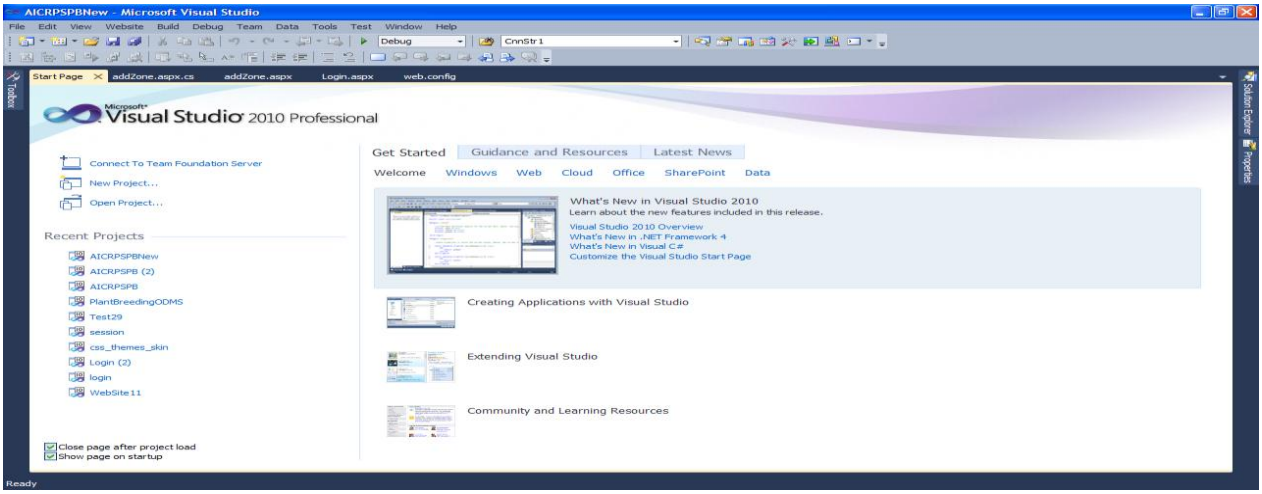


Fig. 13 Microsoft Visual Studio

4. Go to File option in the main menu.

5. Select Open option and then Web Site... option in the submenu as shown below in Fig.14.

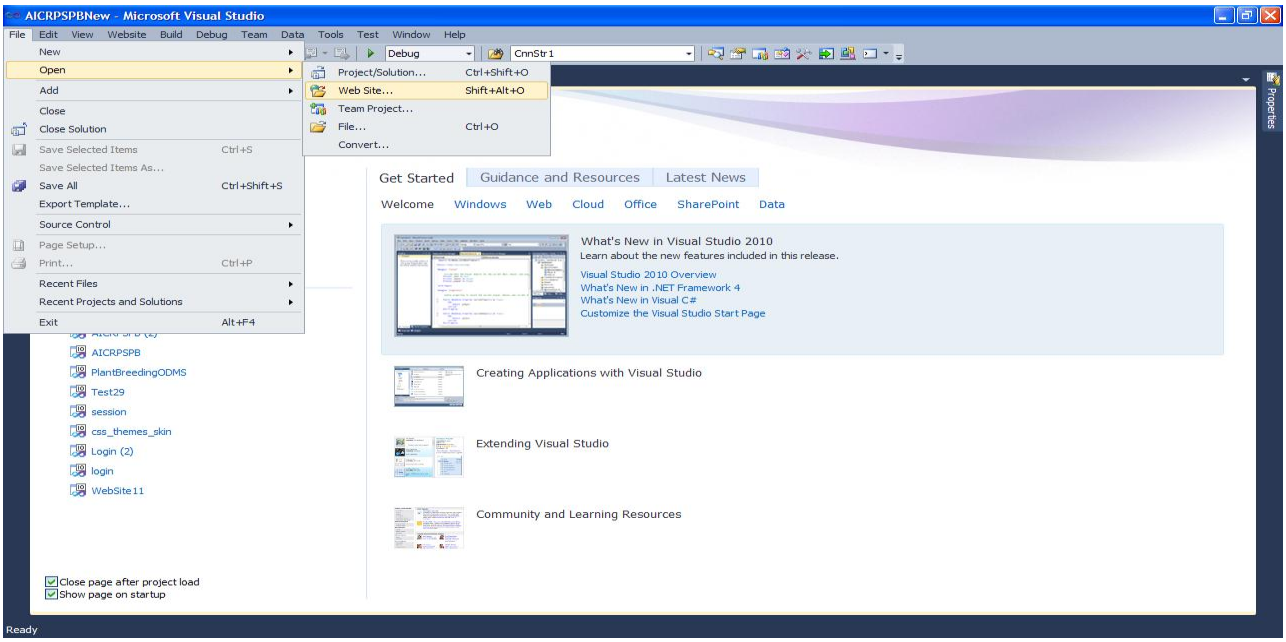


Fig. 14

6. For testing the functionality of the AICRPS s/w after installation, Browse for the AICRPSPB folder in Open Web Site window as shown below in Fig.15.

7. Select the project folder and press Open button.

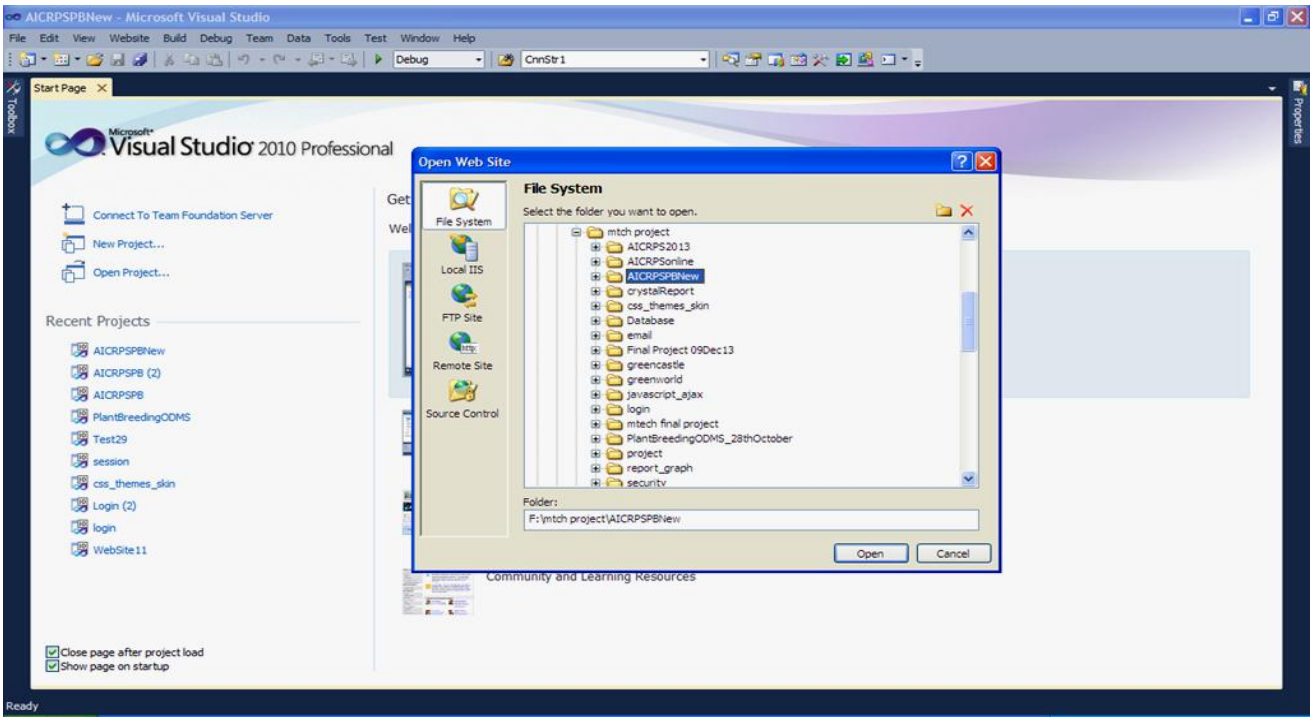


Fig. 15 Open Web Site

8. Go to View option in the main menu.

9. Select Solution Explorer in the submenu as shown below in Fig.16

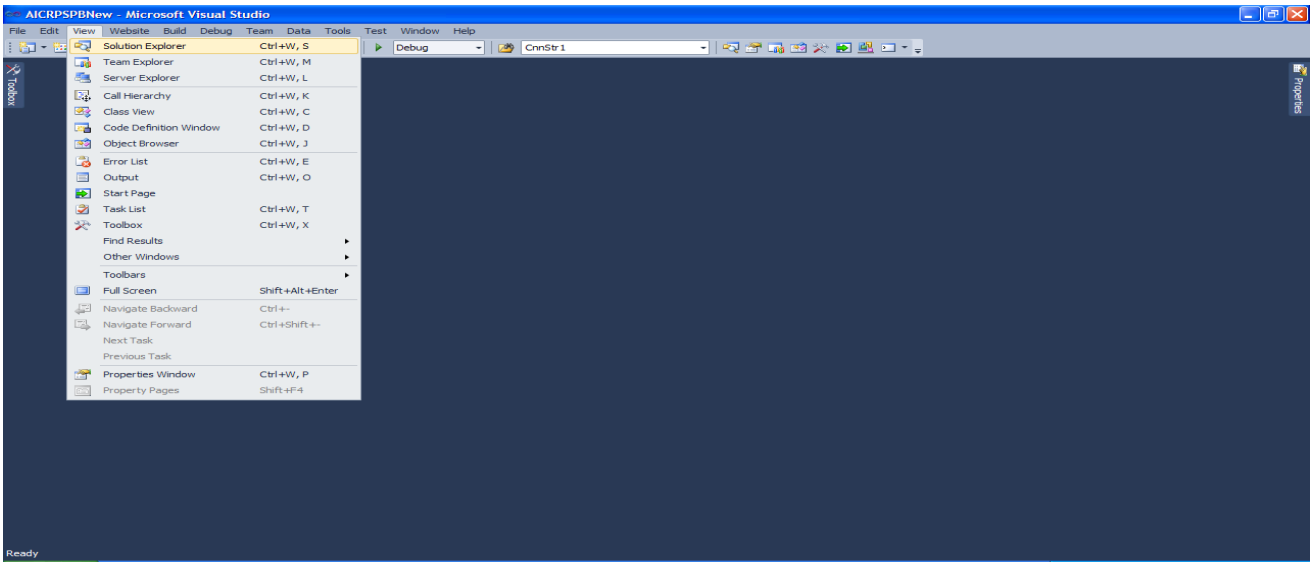


Fig. 16 Solution Explorer

10. Select web.config file from the listing of the Solution Explorer **for database connectivity** as shown in Fig.17.

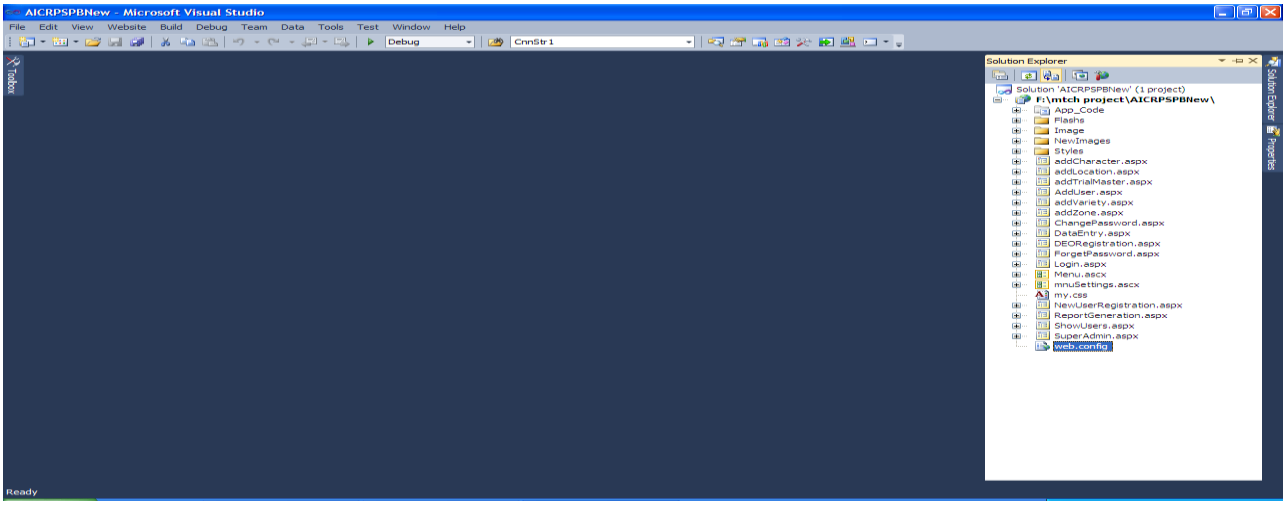


Fig. 17 Solution Explorer window

11. **(Important Step) Double click on web.config file to open its coding page as shown below in Fig 18.**

12. **Replace the selected line in Fig.21 with "Data Source = Comp1; Initial Catalog = Db1;User ID = abcd; Password =abcd1234" where Comp1 is Computer Name , Db1 is Database name , abcd is user id of SQL Server and abcd1234 is Password of the same.**

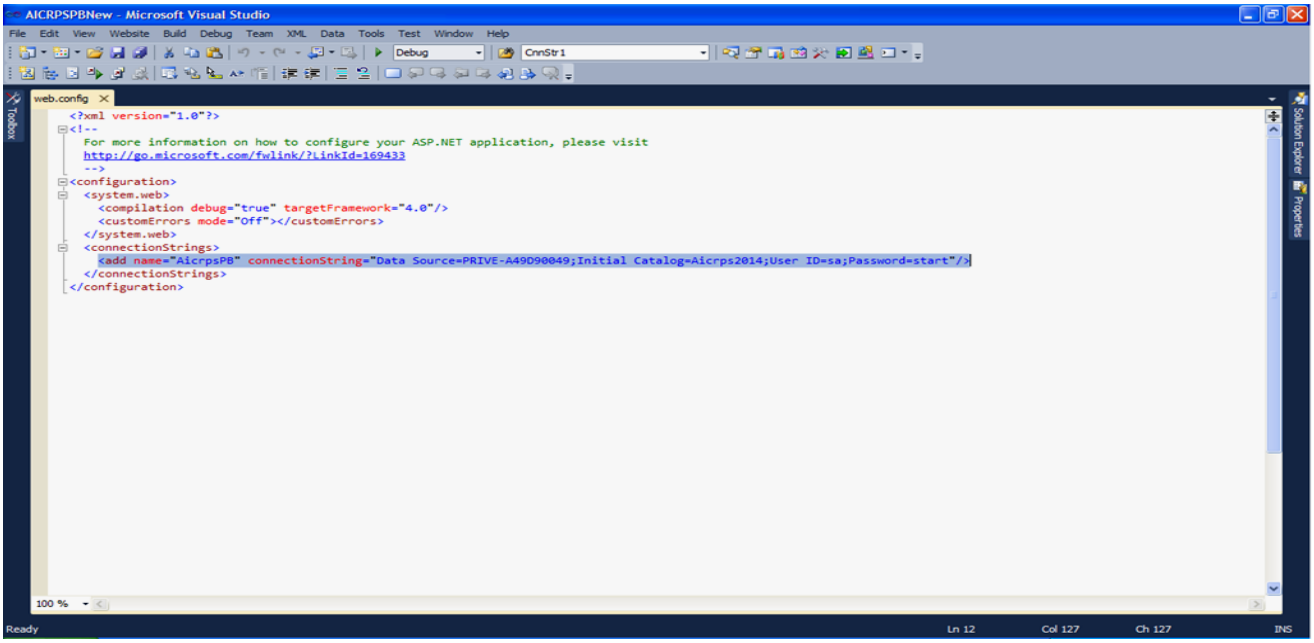


Fig. 18 WEB CONFIG CODE PAGE

13. Select DAL.cs from the sub list of App_Code which appears in the listing of Solution Explorer as shown below in Fig.19.

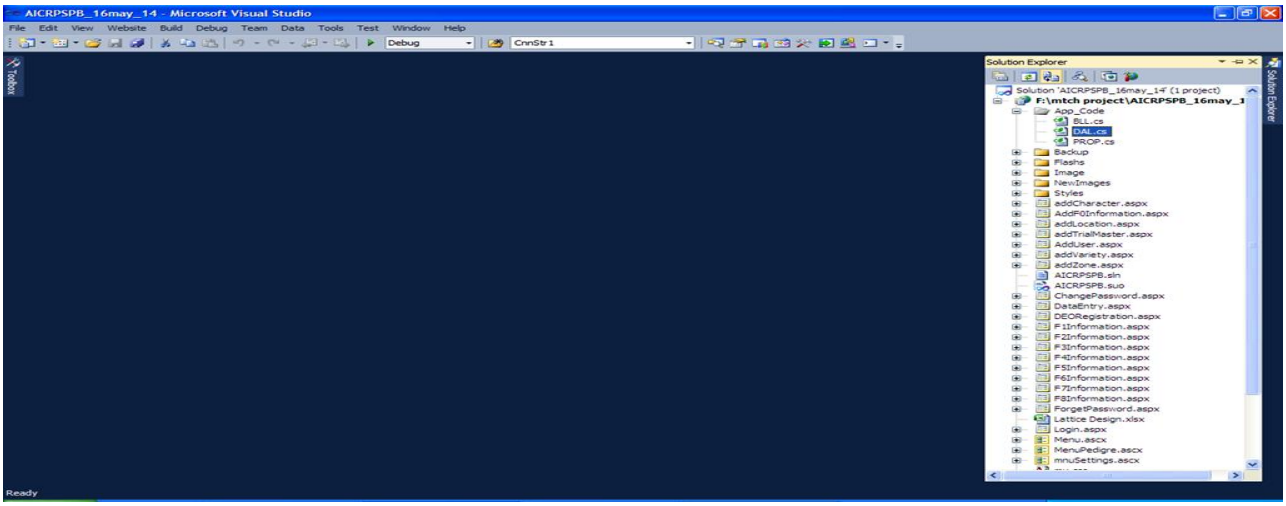


Fig. 19

14. **Double click on DAL.cs to open its coding page as shown below in Fig.20**.

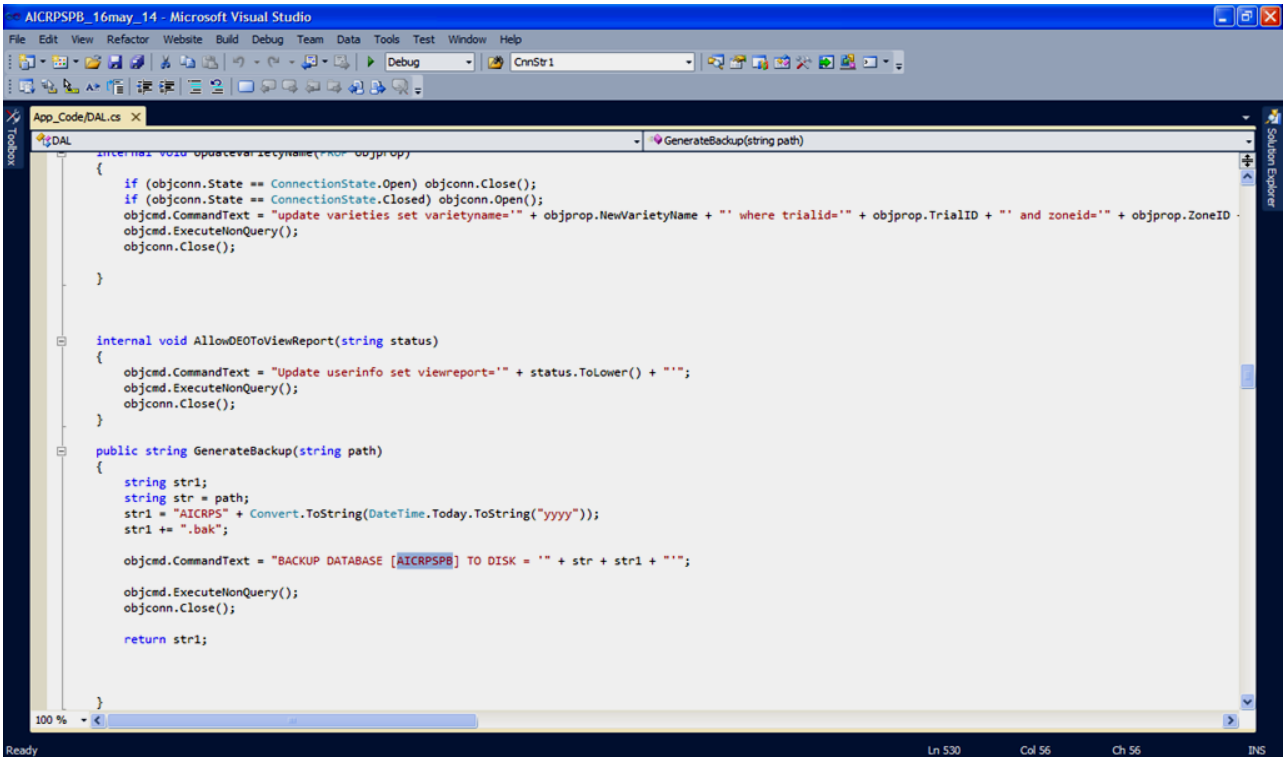


Fig.20

15. **(Important Step) Goto Line no. 530 in GenerateBackup method and replace the selected word within square brackets in Fig.20 with current database name e.g. AICRPSPB to generate database backup file on pressing of** Generate Database Backup **button as shown in Main Menu Page in Fig.15 in User Training Manual.**

16. Select Login.aspx from the list of forms as shown in the Solution Explorer in Fig.21.

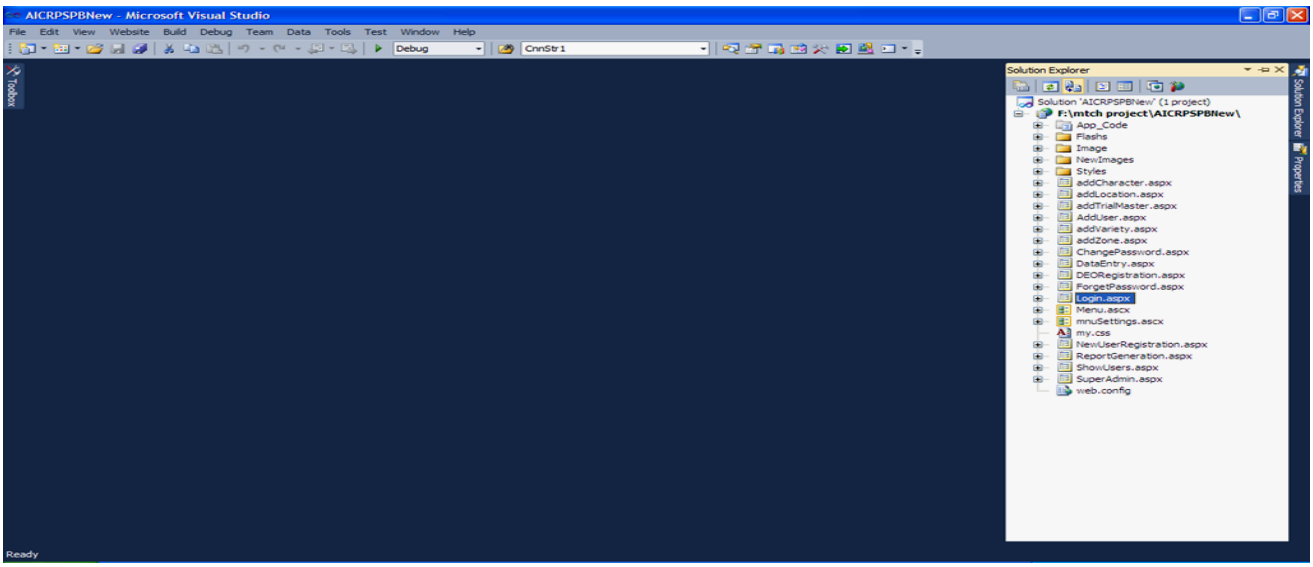
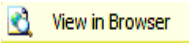


Fig.21

17. Right Click on Login.aspx form.

18. Click 

option as shown below in Fig.22.

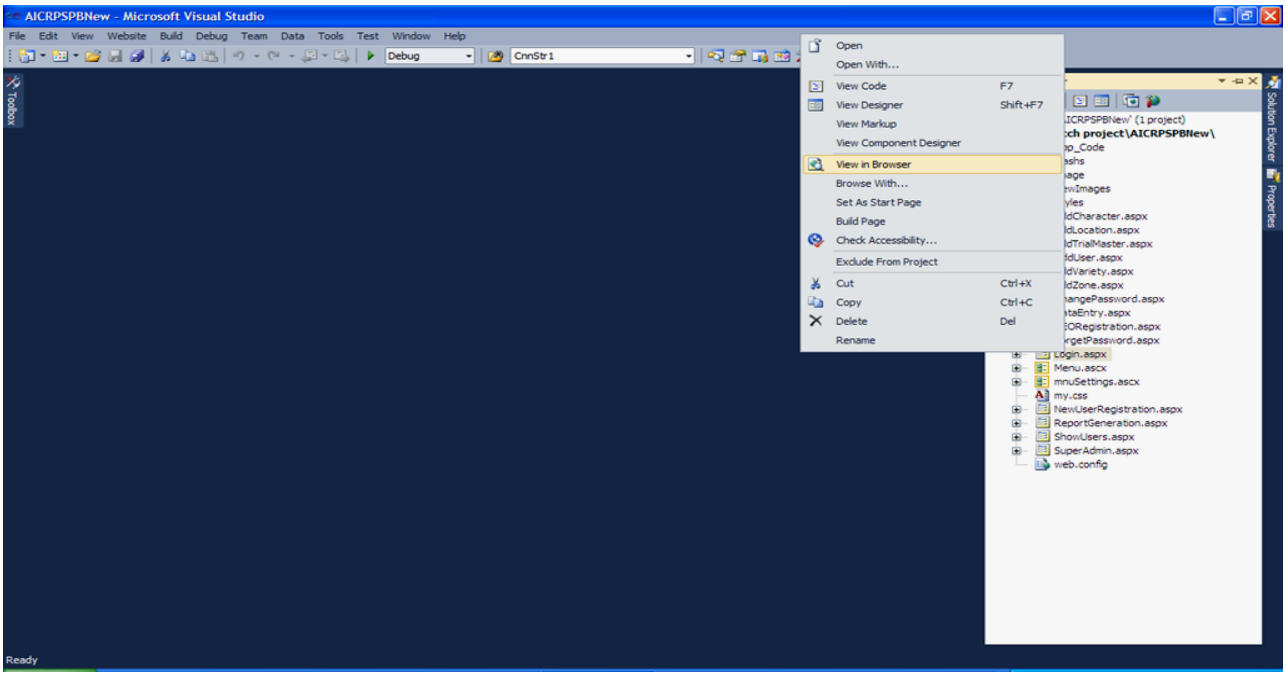


Fig.22

19. Running Login form will appear as shown below in Fig.23.

20. Enter 

and 

and Click 

button to login.

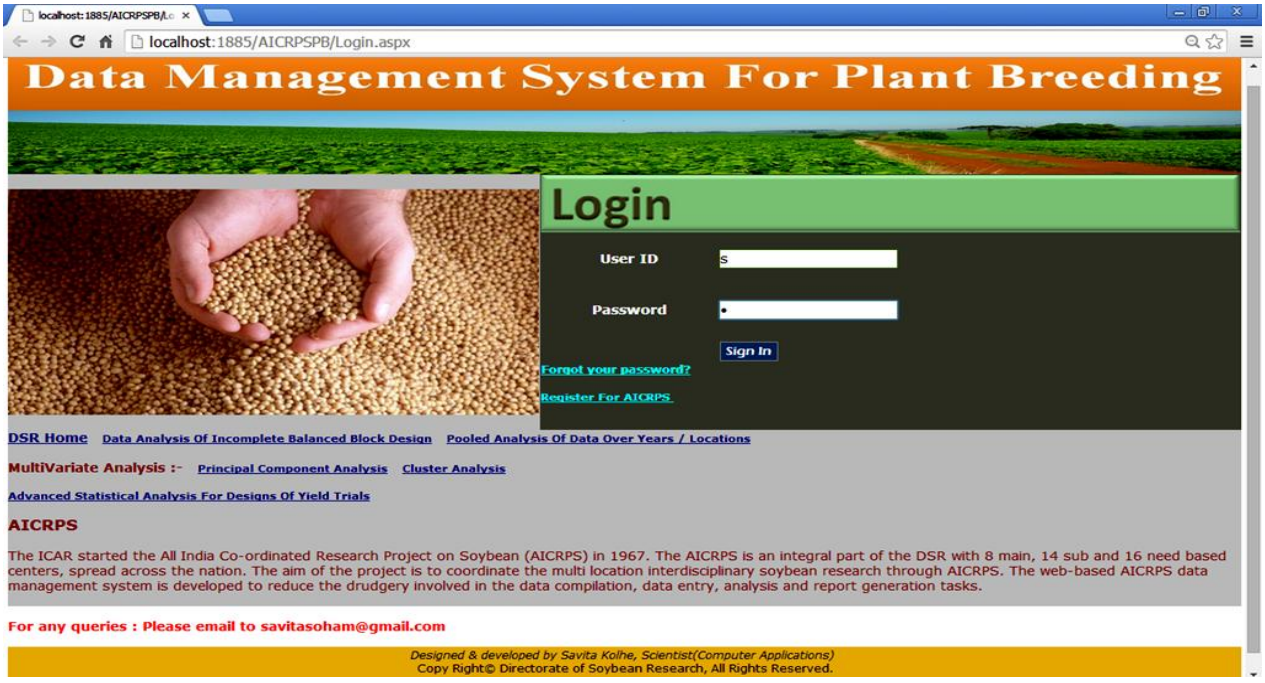


Fig.23. LOGIN FORM (AICRPS)

21. User “Admin” home page will appear as shown below in ADMIN PAGE in Fig.24.

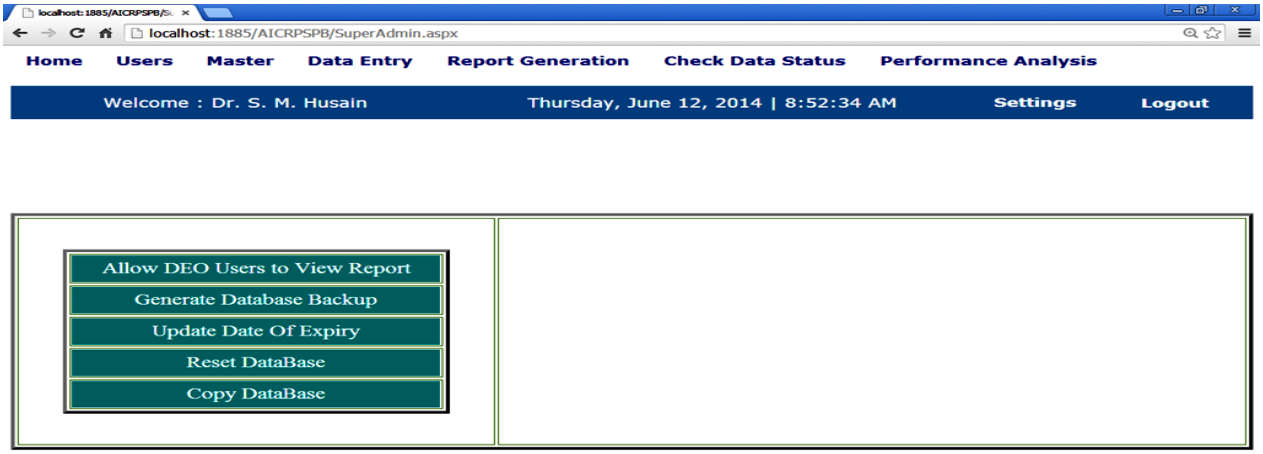


Fig.24. ADMIN PAGE

22. Start using the system as per guidelines provided in the "User Reference Manual for Data Management and Report Generation"

Chapter 3

STEPS FOR CONFIGURING THE SYSTEM FOR RUNNING IT ON REMOTE CLIENT

3.1 (VIRTUAL DIRECTORY INSTALLATION STEPS):

1. Go to Start→ Programs → Administrative Tools → IIS Manager to open "Internet Information Services (IIS) MANAGER WINDOW" as shown below in Fig.25.

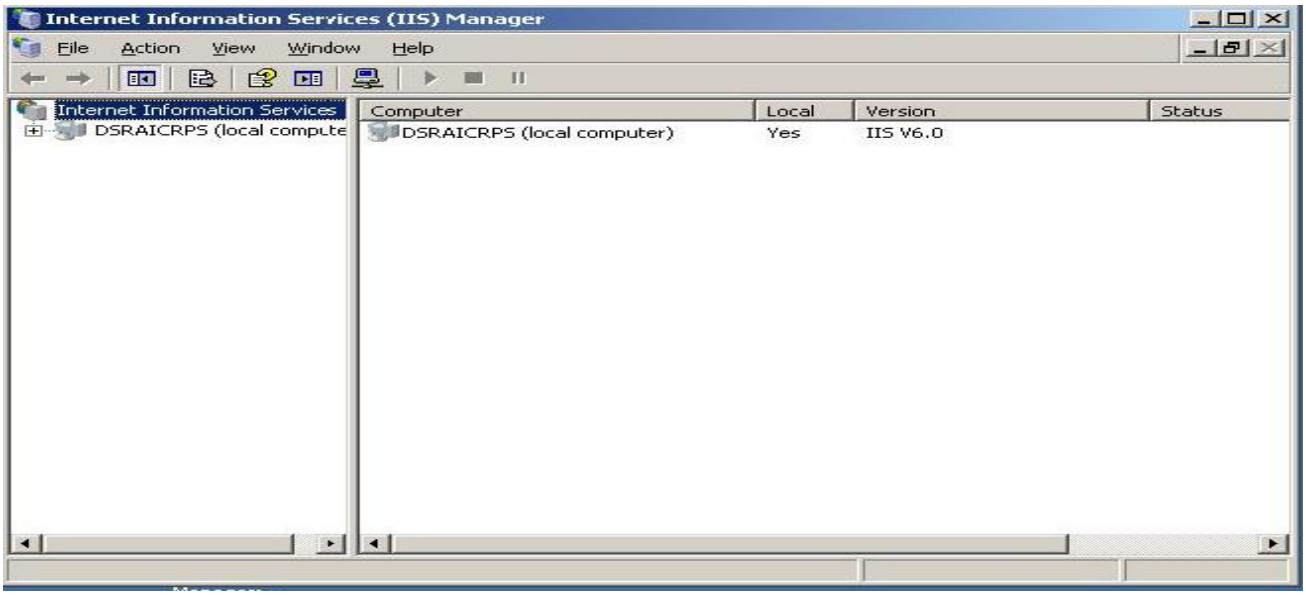


Fig.25 Internet Information Services (IIS) Manager

2. Select 

and open its sub list by clicking "⊞" as shown below in Fig.26.

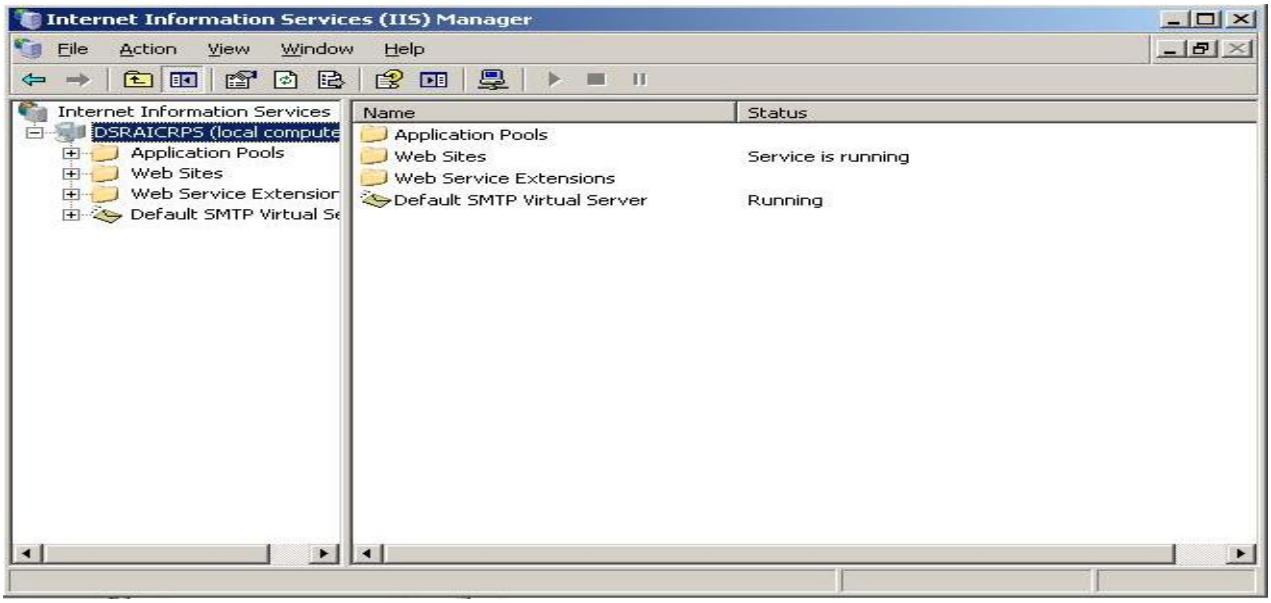
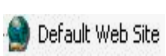


Fig.26

3. Open 

sub list and select 

as shown below in Fig.27.

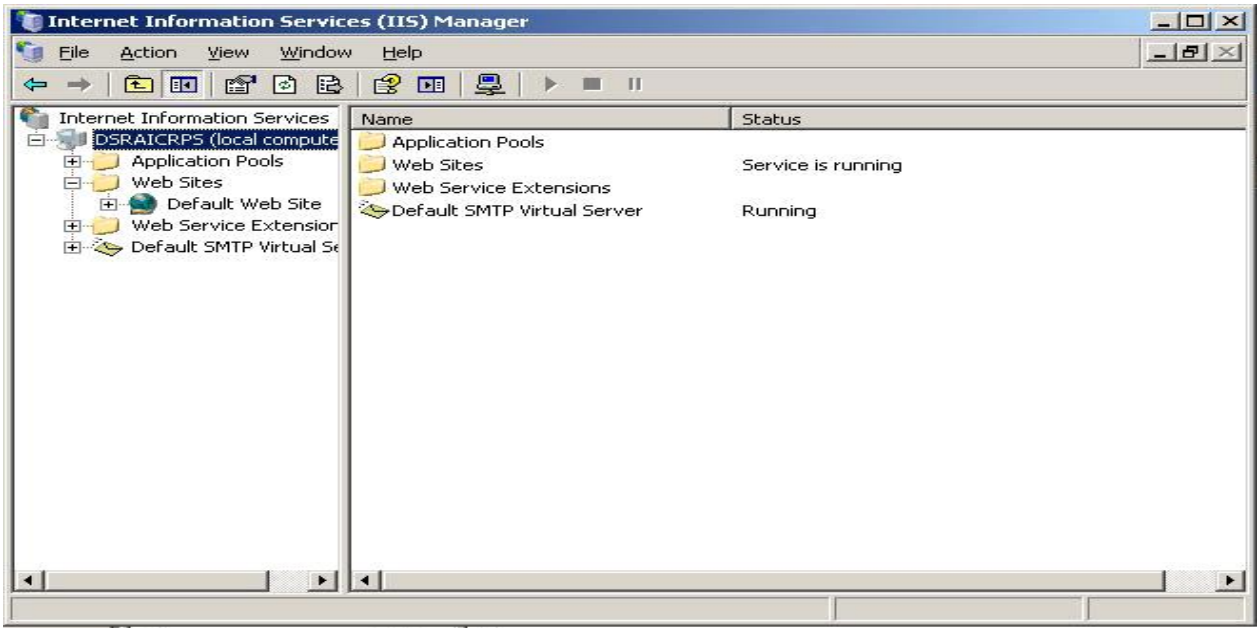


Fig.27

4. Right click on Default Web Site and go to New → Virtual Directory... as shown below in Fig.28.

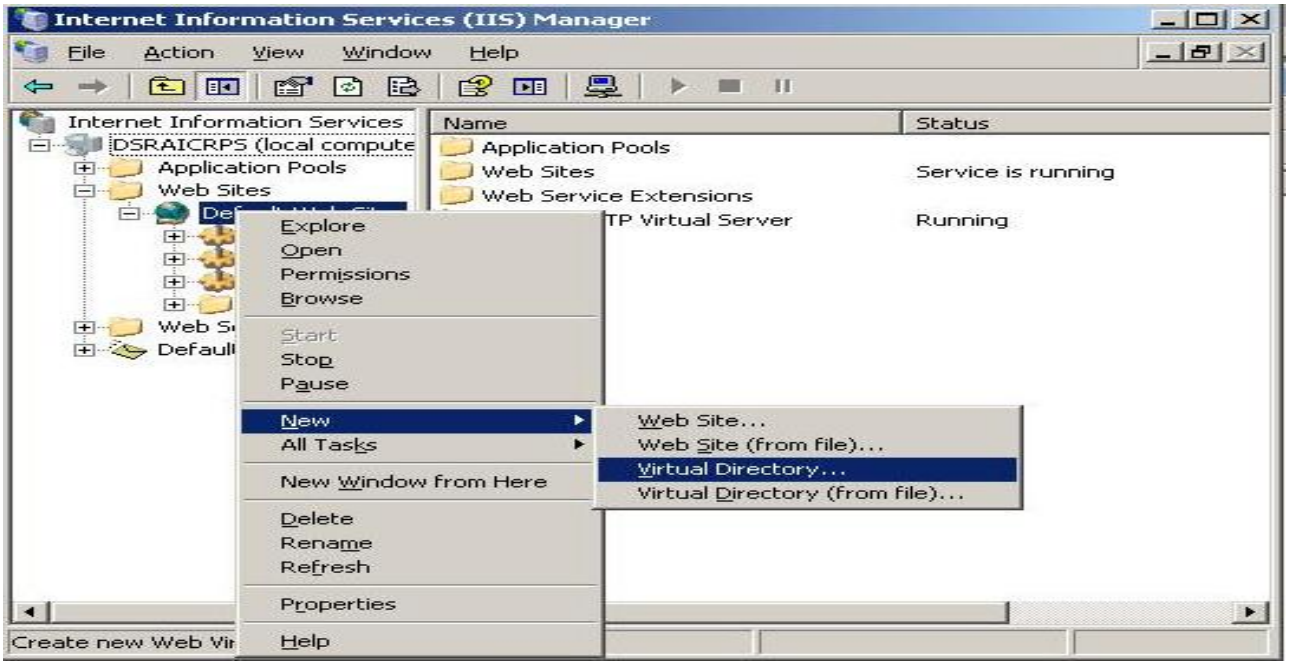


Fig.28

5. In the "VIRTUAL DIRECTORY CREATION WIZARD" press Next > button to continue as shown below in Fig.29.

Fig.29 VIRTUAL DIRECTORY CREATION WIZARD

6. The "VIRRTUAL DIRECTORY ALIAS WINDOW" will open and in this window give virtual directory name that is to be used for providing hyperlink from homepage of institute website e.g. AICRPSPB and press Next > button as shown below in Fig.30.

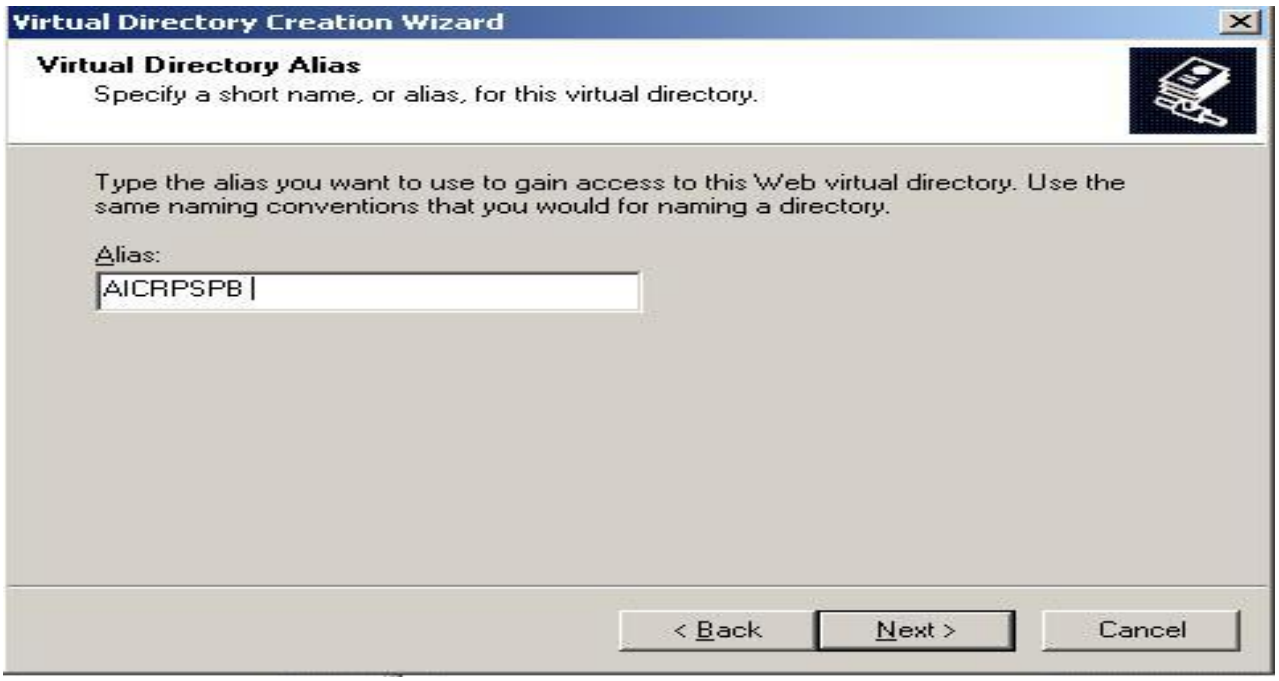


Fig.30

7. In the "WEBSITE CONTENT DIRECTORY WINDOW" click Browse... button to browse for the location where the software is stored and press OK in the "Browse For Folder" window as shown below in Fig.31.

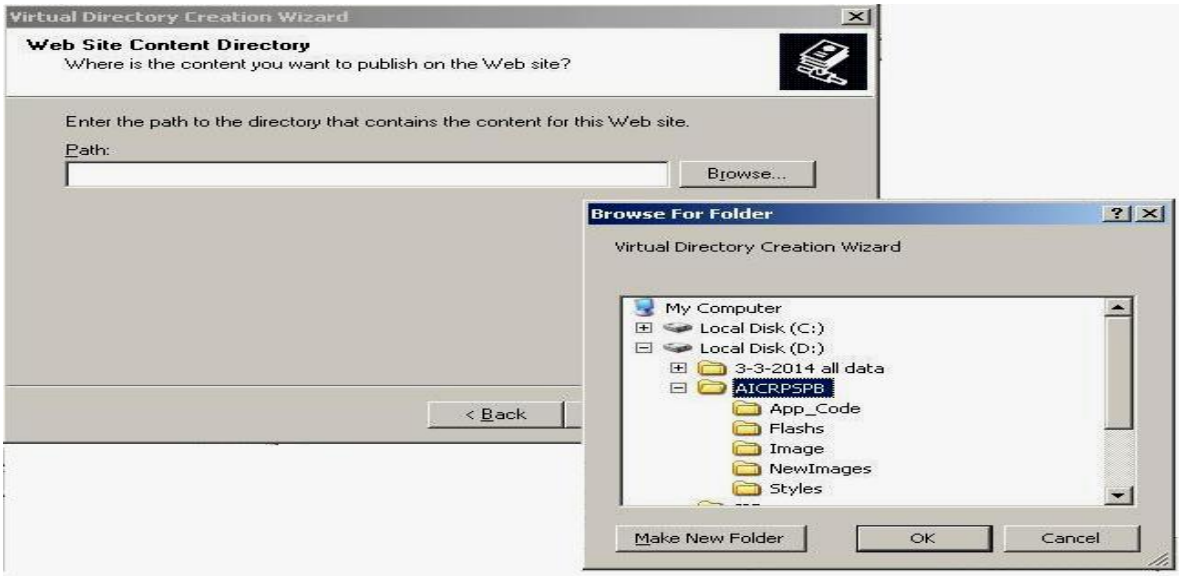


Fig.31 Browse For Folder

8. Then press  button to continue in the "Website Content Directory" as shown below in Fig.32.

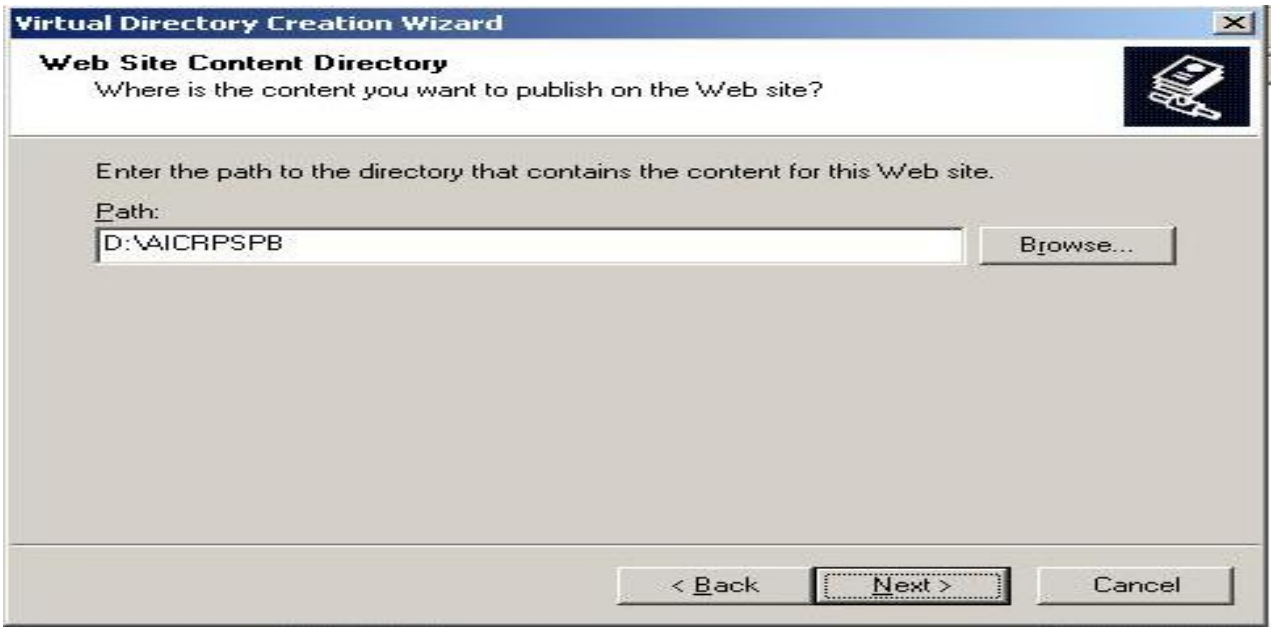


Fig.32 Website Content Directory

9. The "VIRTUAL DIRECTORY ACCESS PERMISSIONS" window will open as shown below in Fig.33.

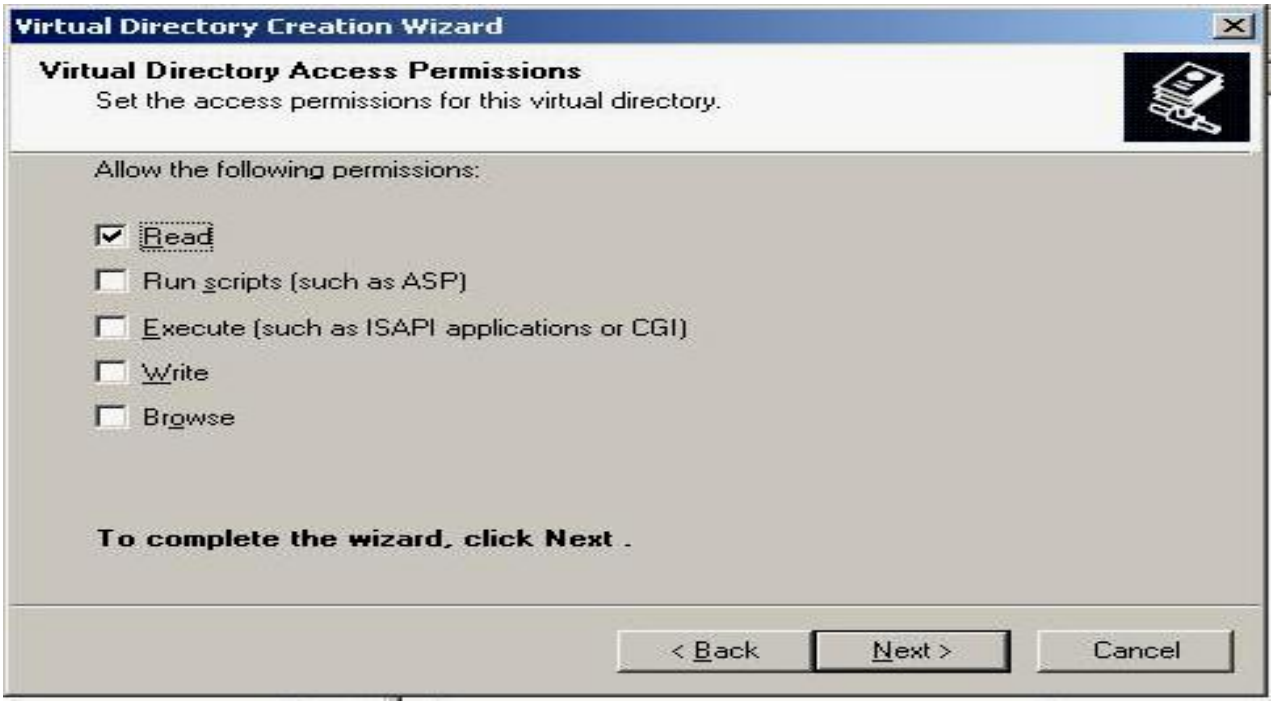


Fig.33 VIRTUAL DIRECTORY ACCESS PERMISSIONS

10. Now check Execute, Run and Browse permissions (Important Step) and press Next > button as shown below in Fig.34.

Note: Don't check write permission otherwise anybody can temper the code.

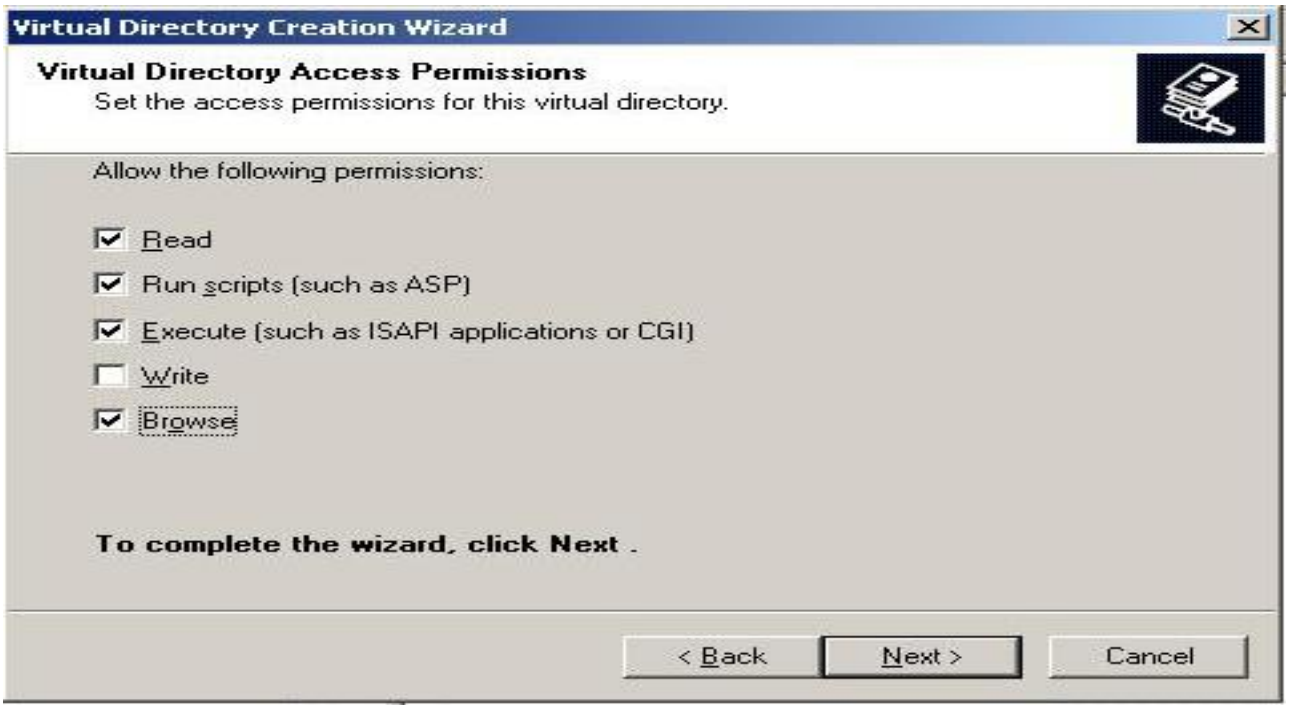


Fig.34

11. Virtual Directory will be created and will appear in listing of Default Web Site in the panel on the left hand side of IIS Manager Window as shown below in Fig.35.

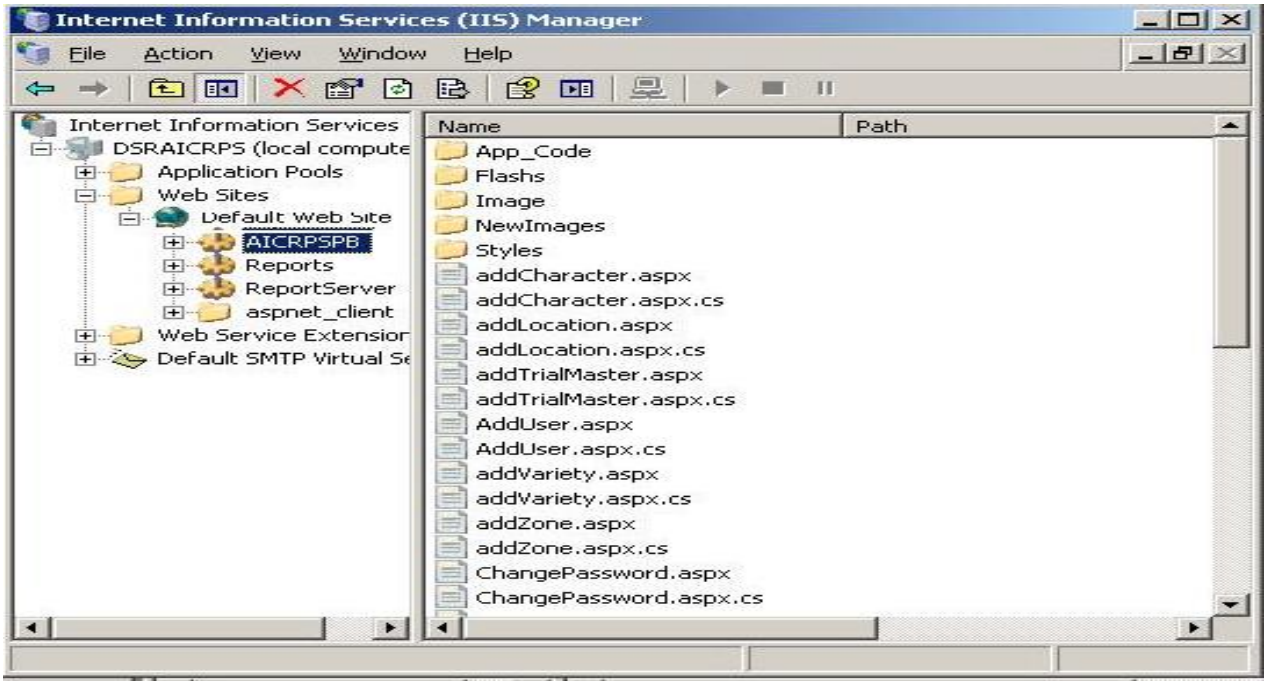


Fig.35

3.2 (ASP.NET Settings in Virtual Directory Properties):-

12. Right click on Virtual Directory e.g. AICRPSPB and select Properties from the popup menu as shown below in Fig.36.

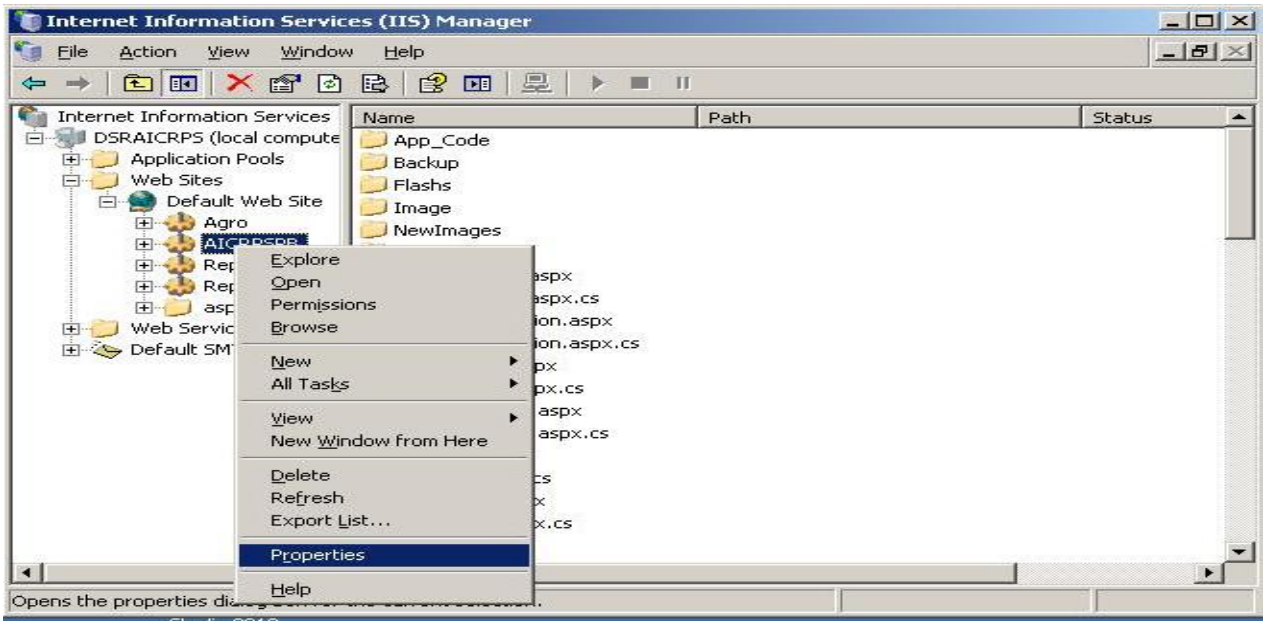


Fig.36

13. The AICRPSPB Properties window will open as shown below in Fig.37.

14. Press ASP.NET tab which appears at the top of AICRPSPB Properties windows to open ASP.NET Settings panel in the same window.

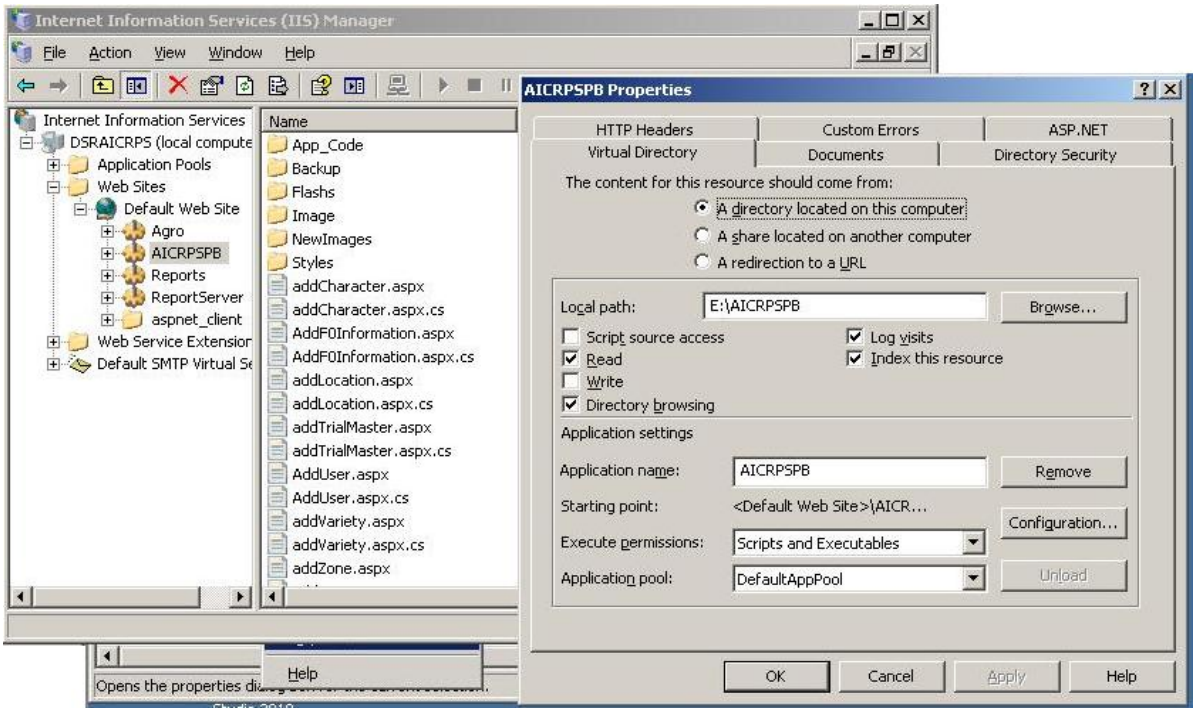


Fig.37

15. **Select ASP.NET version as** 4.0.30319 **from the list which appears in front of** ASP.NET version: **and press** OK **button to apply the setting, as shown below in Fig.38.**

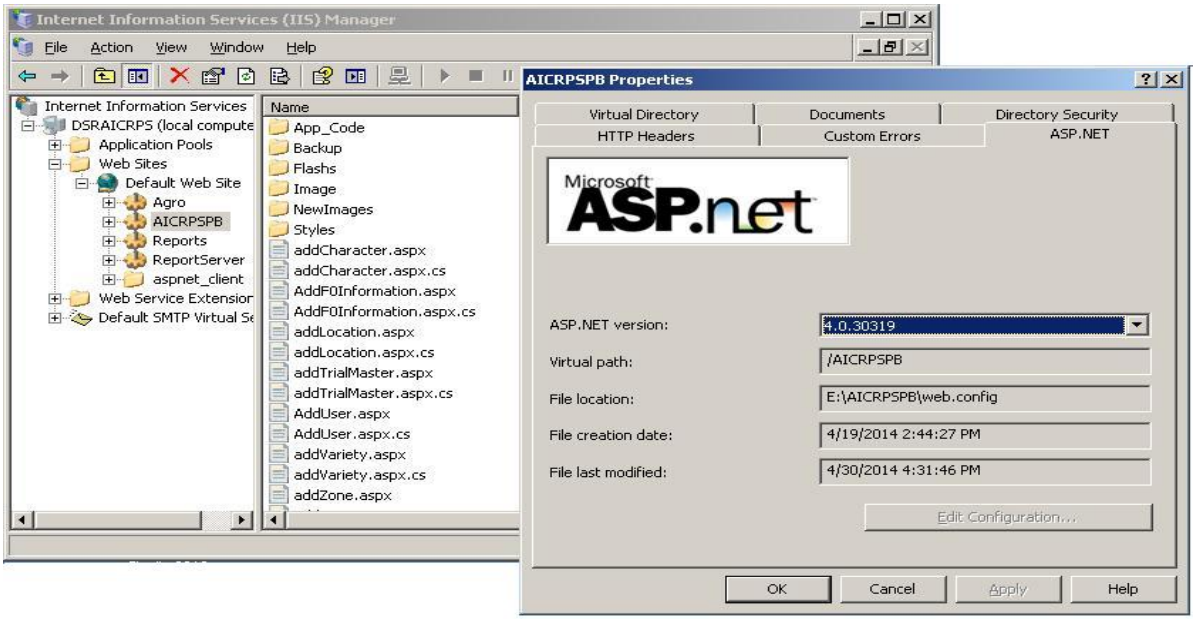


Fig.38

Note: Steps 12 to 15 are necessary steps to be followed for setting ASP.NET version; otherwise the AICRPS Data Management System will not run.

16. Create hyperlink at the "homepage of institute website" for accessing the software at client end e.g. AICRPS Data-Entry New! as shown below in Fig.39. In this, the path of the virtual directory will be used and not the physical path of the Folder containing the code. (e.g http://202.141.78.206/AICRPSPB/login.aspx).

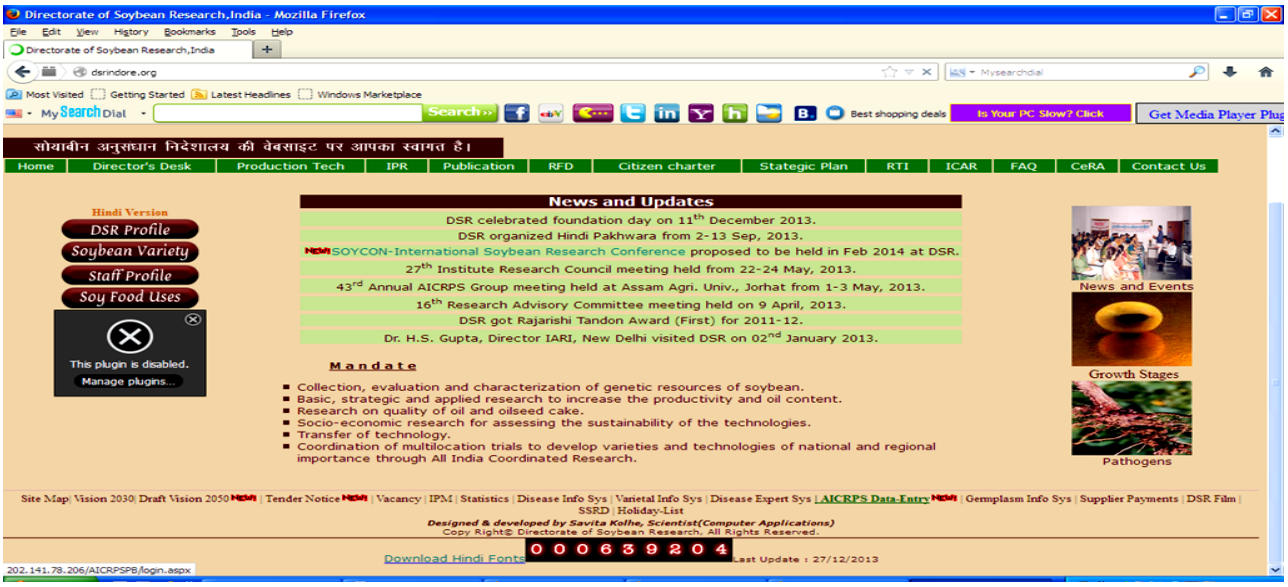


Fig.39

Chapter 4

TECHNICAL DETAILS ABOUT THE SYSTEM

4.1 Aims of the system developed:

The AICRPS data management and report generation system was developed with the following objectives.

1. To ensure that the routine processing of trial data and production of reports are carried out in an efficient and effective way thus significantly reducing the time and drudgery involved in-

- Compilation of AICRPS plant breeding Trial data obtained from different AICRPS Centers.
- Preparation of yearly summary table reports.
- Performance Analysis based on historic data's.

2. To computerize the whole manual procedure by developing a user-friendly system.
3. To provide all multi-location users with facilities for on-line data-entry into the database to ease the work of compilation of huge data.
4. To allow safe storage of, and easy access to performance data for varieties.

4.2 Data Collection-

The research on soybean improvement and identification of better varieties to suit varied location specific requirements of different regions of the country is being continued. Improved lines/material developed as a result of breeding efforts at different centers are evaluated in three tier system consisting of –

1. Initial Varietal Trial (IVT)
2. Advanced Varietal Trial-I (AVT-I)
3. Advanced Varietal Trial-II (AVT-II)

These trials are conducted across the country in five zones viz. “Northern Hill”, “Northern Plain”, “Central”, “Southern” and “North-eastern” zones. The performance of test varieties for a particular zone in each trial are compared against a few check varieties in terms of ‘Rank’ assigned based on the variety-wise ‘Mean’. Only those varieties, which perform better with respect to yield performance than the check varieties in a particular zone, are promoted to the next tier in the 3-tier testing system. So, the data, collected on various performance parameters on each trial by the coordinated centers spread all over the country at different locations of five zones, is compiled at the DSR Indore and summary table reports are prepared every year.

4.3 Description of the system:

The overall computerized system is user-friendly and interactive and has been designed in such a manner that even a person with limited computer skills can handle it easily. The complete system is developed using ASP (Active Server Pages).NET. The database at back end is designed using SQL Server 2005 relational database. The reports are generated in the form of summary tables which is exported to EXCEL worksheets. The total software size is 15 MB.

The main user-interface is provided in the form of Menu-bar with menu options viz., ‘Home’, ‘Users’, ‘Master’, ‘Data-entry’, ‘Report Generation’. Each of these menu options has a few sub-menu options which when clicked will open a certain form to perform certain task. In ‘Master’ Menu, Master entries viz. Character, Location, Trial, Zone and Variety are done with their respective entry-forms. The Variety list for a particular zone and trial is entered through ‘Variety-Information’ form that is available to the user by clicking ‘Variety’ sub-menu option of ‘Master’, main menu option. The user can do the local as well as on-line data entry through “Data-Entry page” opened by clicking “Data Entry” option in the main menu and subsequently the reports can be generated by using ‘Report Generation’ form.

The complete database comprises of ten tables along with their respective fields and data types as shown below –

1. **ZoneMaster**

	Column Name	Data Type	Allow Nulls
🔑	Id	int	☐
	ZoneName	varchar(100)	☐
	ZoneCode	varchar(10)	☐

Limitations-

i. ZoneName should not be more than 100 characters.

ii. ZoneCode should not be more than 10 characters.

2. TrialMaster

Column Name	Data Type	Allow Nulls
Id	int	☐
TrialName	varchar(100)	☐
TrialCode	varchar(10)	☐
NumberOfReplicas	int	☐

Limitations-

i. TrialName should not be more than 100 characters.

ii. TrialCode should not be more than 10 characters.

3. CharacterMaster

Column Name	Data Type	Allow Nulls
Id	int	☐
CharacterName	varchar(100)	☐

Limitations-

i. CharacterName should not be more than 100 characters.

4. Locations

Column Name	Data Type	Allow Nulls
Id	int	☐
LocationName	varchar(100)	☐
ZoneId	int	☐

Limitations-

i. LocationName should not be more than 100 characters.

5. Varieties

Column Name	Data Type	Allow Nulls
Id	int	☐
VarietyType	varchar(10)	☐
VarietyName	varchar(50)	☐
TrialId	int	☐
ZoneId	int	☐
SequenceNo	int	☐

Limitaions-

i. VarietyName should not be more than 50 characters.

ii. VarietyType should not be more than 10 characters.

6. MainData

Column Name	Data Type	Allow Nulls
Id	int	☐
TrialID	int	☐
LocationID	int	☐
VarietyID	int	☐
CharacterID	int	☐
ReplicationID	int	☐
ReplicaData	decimal(10, 2)	☑

Limitations-

i. ReplicaData should contain 10 digit before decimal point and 2 digit after decimal point e.g. 1234567890.12

7. MeanData

Column Name	Data Type	Allow Nulls
Id	int	☐
TrialID	int	☐
LocationID	int	☐
VarietyID	int	☐
CharacterID	int	☐
MeanData	decimal(10, 2)	☐

Limitations-

i. MeanData should contain 10 digit before decimal point and 2 digit after decimal point e.g. 1234567890.12

8. Footers

Column Name	Data Type	Allow Nulls
Id	int	☐
TrialID	int	☐
LocationID	int	☐
CharacterID	int	☐
NetPlotSize	decimal(7, 2)	☐
DateOfSowing	datetime	☐
CD	decimal(7, 2)	☑
CV	decimal(7, 2)	☑

Limitations-

i. NetPlotSize, CD and CV should contain 7 digit before decimal point and 2 digit after decimal point e.g. 1234567.12

ii. DateOfSowing should be of the form dd/mm/yy.

9. UserInfo

Column Name	Data Type	Allow Nulls
Id	int	☐
Name	varchar(MAX)	☐
City	varchar(MAX)	☐
CorrespondenceAddress	varchar(MAX)	☑
PermanentAddress	varchar(MAX)	☑
Email	varchar(MAX)	☐
AlternativeEmail	varchar(MAX)	☑
Mobile	varchar(MAX)	☐
Phone	varchar(MAX)	☑
UserId	varchar(MAX)	☑
Password	varchar(MAX)	☑
LocationId	int	☑
DOE	varchar(50)	☑
UserLevel	int	☑

10. Temp

Column Name	Data Type	Allow Nulls
S_No	int	☑
Mean	decimal(10, 2)	☑
		☐

Limitations-

i. Mean should contain 10 digit before decimal point and 2 digit after decimal point e.g. 1234567890.12

11. Remarks

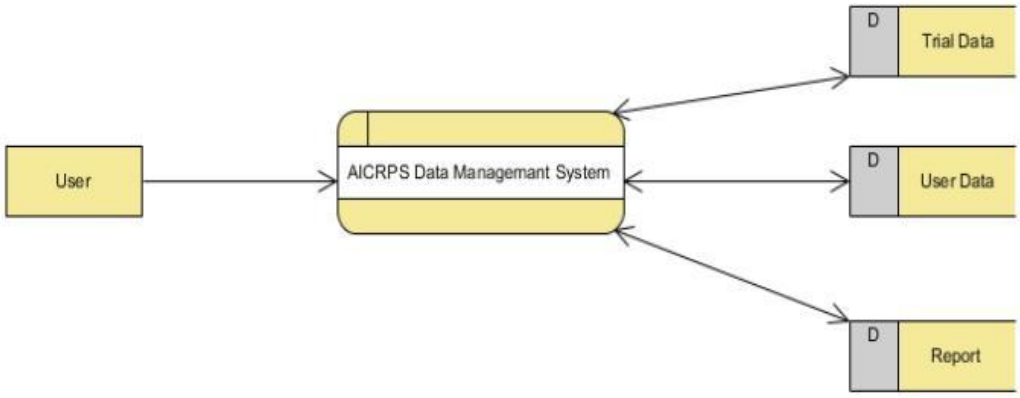
Column Name	Data Type	Allow Nulls
Id	int	☐
TrialId	int	☐
LocationId	int	☐
CharacterId	int	☐
Remarks	varchar(MAX)	☑

The database size without insertion of data is nearly 2MB and with insertion of the data from all the locations, the size becomes 170MB or more depending on the number of varieties in each trial every year.

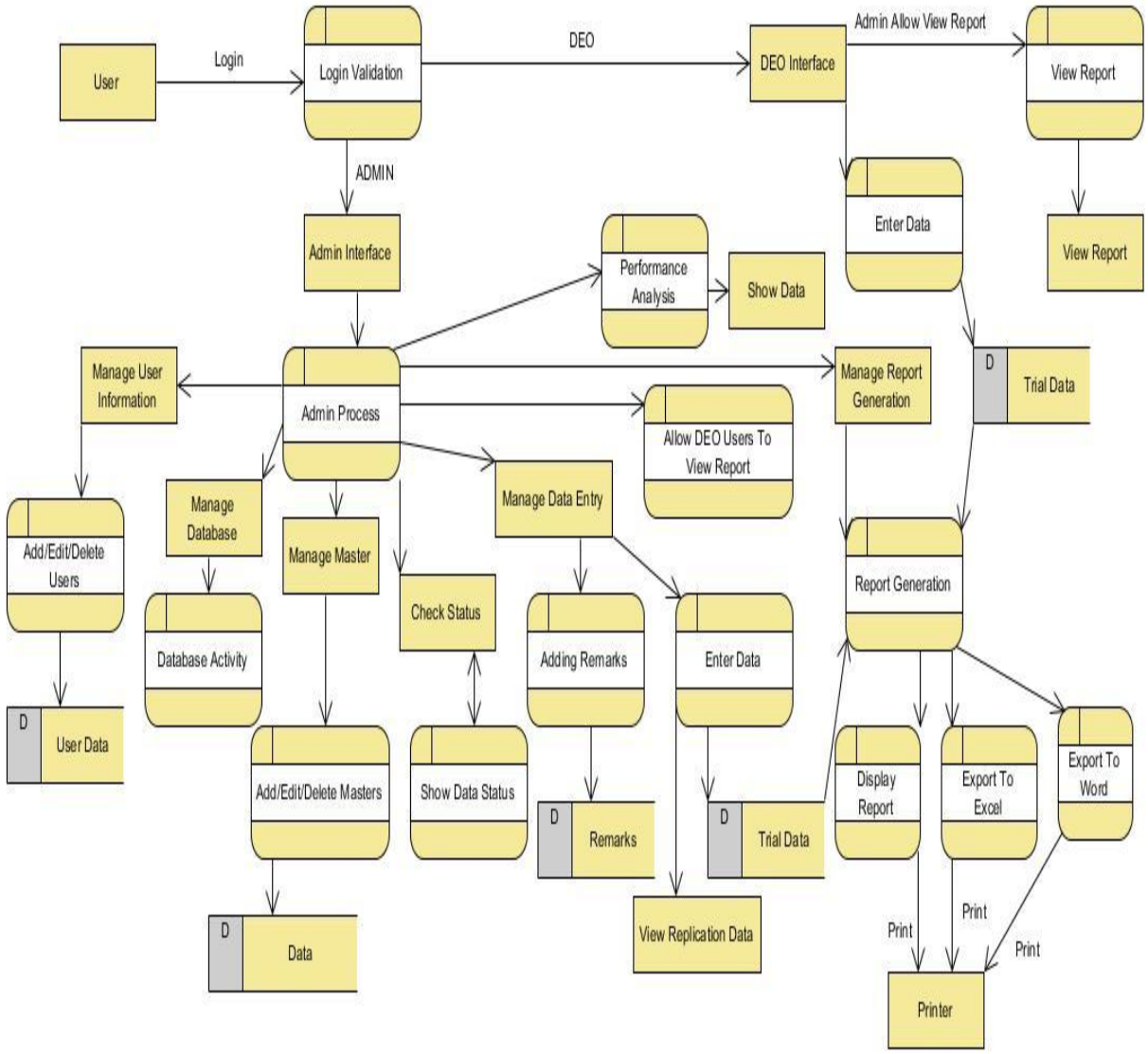
4.4 Data Flow Diagram:

The logical operation of the system can be described with the data flow diagram as shown in Fig.40. It shows the flow of data through the system and the work or processing performed by the system.

DFD Level 0



DFD Level 1


User
Login
Login Validation
DEO
DEO Interface
Admin Allow View Report
View Report
ADMIN
Admin Interface
Performance Analysis
Show Data
Enter Data
View Report
Manage User Information
Admin Process
Manage Report Generation
D
Trial Data
Allow DEO Users To View Report
Add/Edit/Delete Users
Manage Database
Manage Master
Manage Data Entry
Check Status
Report Generation
Database Activity
Adding Remarks
Enter Data
D
User Data
Add/Edit/Delete Masters
Show Data Status
Display Report
Export To Excel
Export To Word
D
Remarks
D
Trial Data
D
Data
View Replication Data
Print
Print
Print
Printer

DFD Level 2

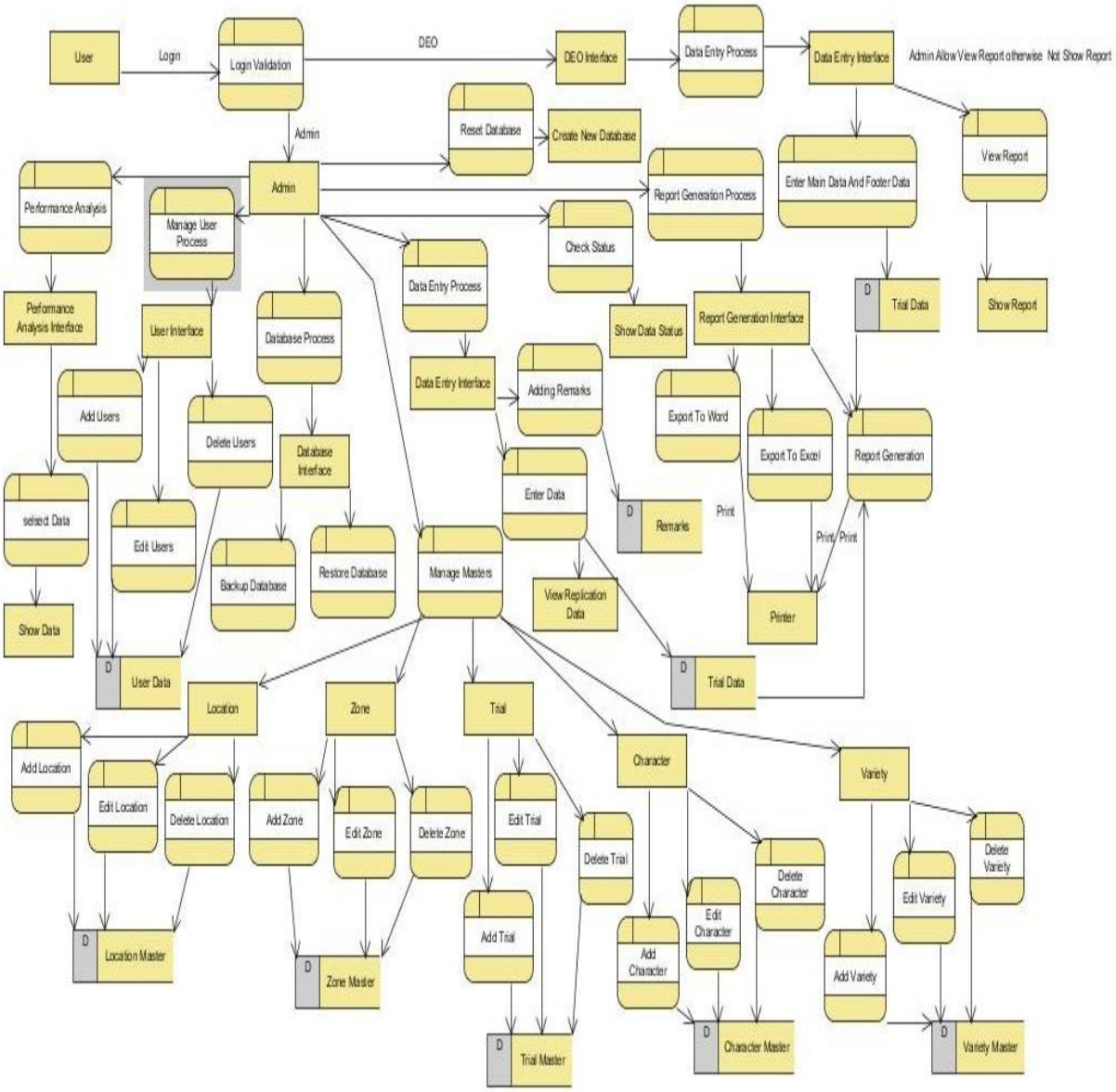


Fig.40

4.5 E-R Diagram:-

The whole system design can be viewed with the "Entity- Relationship (E-R) diagram" as shown below in Fig.41. The ER-model is a conceptual data model of the system. The diagram shows the kind and organization of the data that is stored in the database.

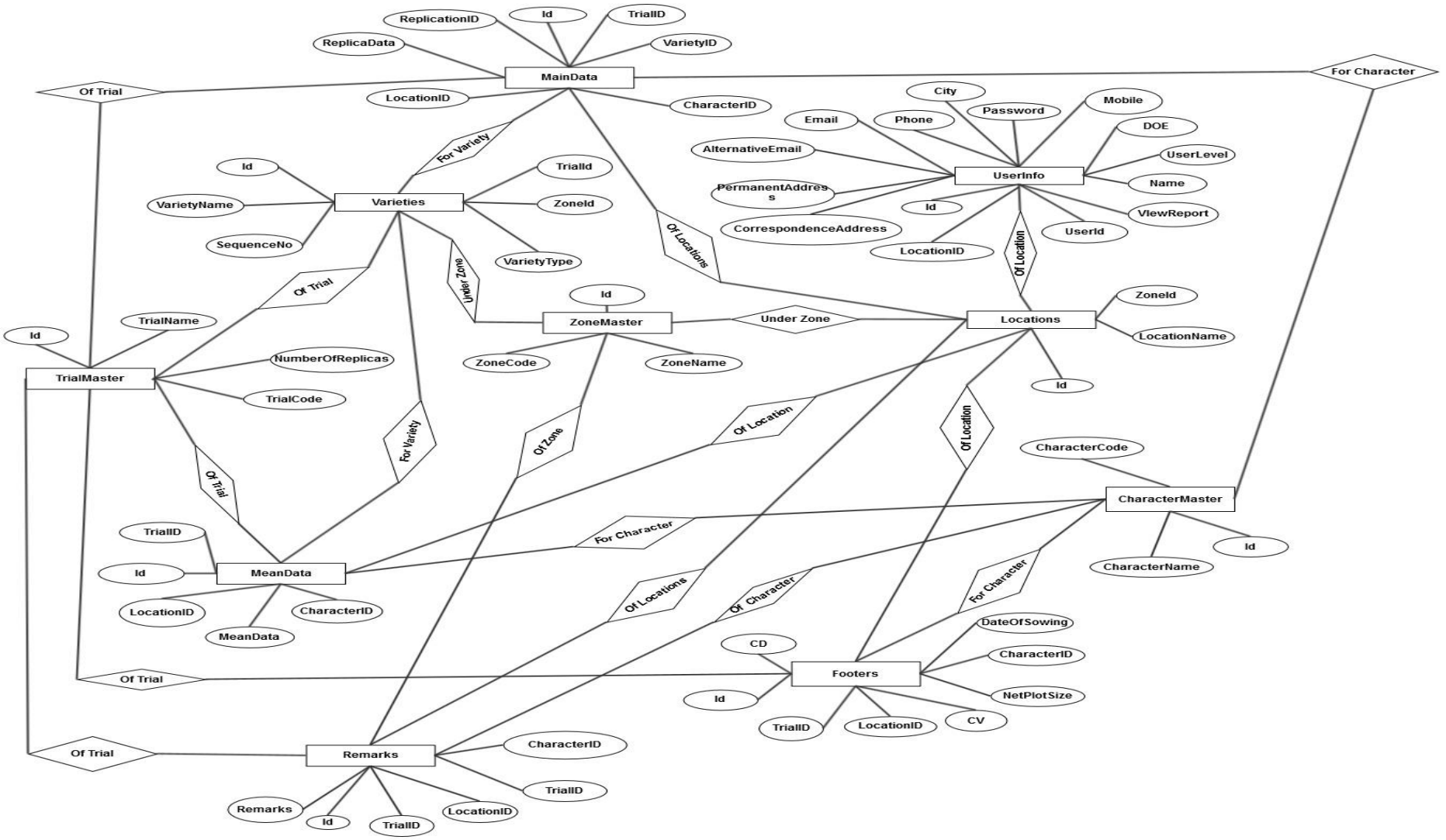

ReplicationID
Id
TrialID
ReplicaData
VarietyID
MainData
For Character
Of Trial
LocationID
CharacterID
City
Password
Mobile
Email
Phone
DOE
AlternativeEmail
UserLevel
For Variety
UserInfo
Id
Name
PermanentAddress
VarietyName
Varieties
TrialId
ZoneId
Id
ViewReport
CorrespondenceAddress
SequenceNo
VarietyType
UserId
LocationID
Of Locations
Of Location
Of Trial
Under Zone
Id
ZoneId
TrialName
ZoneMaster
Locations
Id
LocationName
ZoneCode
ZoneName
NumberOfReplicas
TrialMaster
Id
TrialCode
For Variety
Of Zone
Of Location
Of Location
CharacterCode
Of Trial
CharacterMaster
TrialID
For Character
Id
Id
MeanData
CharacterName
Of Locations
Of Character
For Character
LocationID
CharacterID
MeanData
DateOfSowing
CD
CharacterID
Footers
Of Trial
Id
NetPlotSize
TrialID
LocationID
CV
Of Trial
Remarks
CharacterID
TrialID
Remarks
Id
TrialID
LocationID

Fig. 41 Entity-Relationship (E-R) diagram of the system

4.6 Use Case Diagram:-

A use case diagram is a graphic depiction of the interactions among the elements of a system. A use case is a methodology used in system analysis to identify, clarify, and organize system requirements. In this context, the term "system" refers to something being developed or operated, such as a **AICRPS DATA MANAGEMENT SYSTEM** software. Use case diagrams are employed in UML (Unified Modeling Language), a standard notation for the modeling of real-world objects and systems.

System objectives can include planning overall requirements, validating a hardware design, testing and debugging a software product under development, creating an online help reference, or performing a consumer-service-oriented task. For example, use cases of **AICRPS DATA MANAGEMENT SYSTEM** software for Admin would include managing characters, managing trials, managing DEO users, etc. A use case diagram contains four components.

- The boundary, which defines the system of interest in relation to the world around it.
- The actors, usually individuals involved with the system defined according to their roles.
- The use cases, which the specific roles are played by the actors within and around the system.
- The relationships between and among the actors and the use cases.

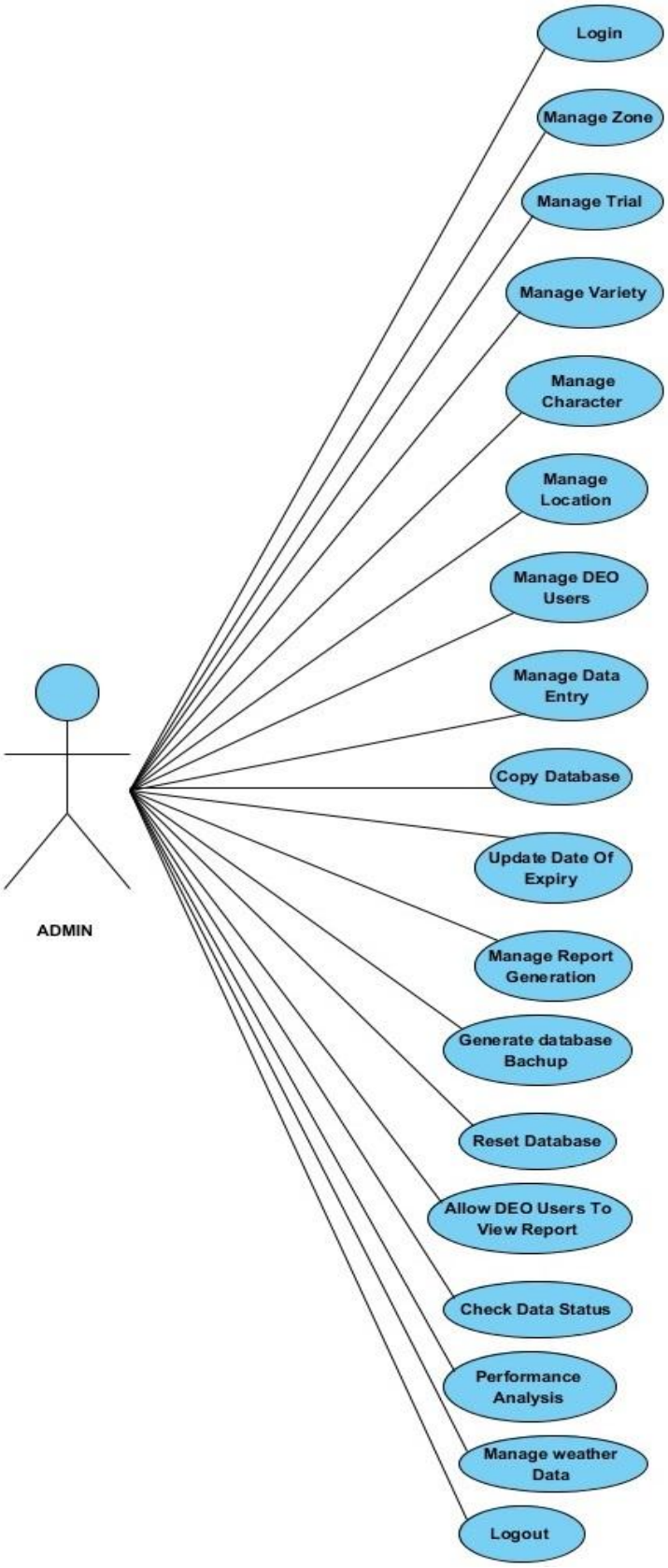


Fig.42 Use Case for Admin

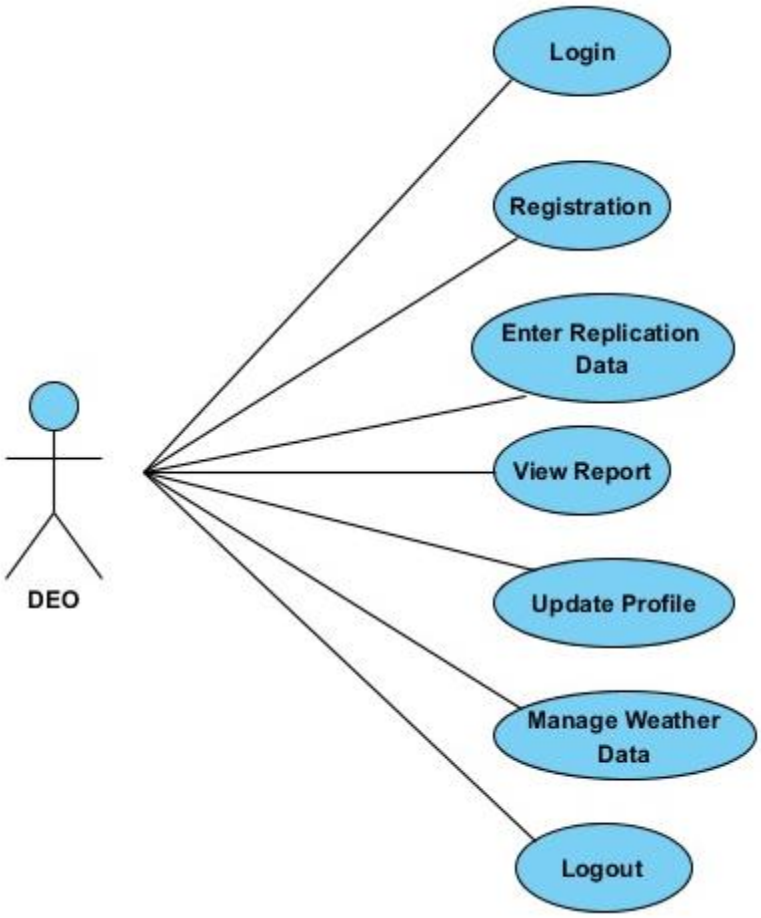


Fig.43 Use Case for DEO

4.7 Activity Diagram:-

In Unified Modeling Language (UML), an activity diagram is a graphical representation of an executed set of procedural system activities and considered a state chart diagram variation. Activity diagrams describe parallel and conditional activities, use cases and system functions at a detailed level. An activity diagram is used to model a large activity's sequential work flow by focusing on action sequences and respective action initiating conditions. The state of an activity relates to the performance of each workflow step.

An activity diagram is represented by shapes that are connected by arrows. Arrows run from activity start to completion and represent the sequential order of performed activities. Black circles represent an initial workflow state. A circled black circle indicates an end state. Rounded rectangles represent performed actions, which are described by text inside each rectangle.

A diamond shape is used to represent a decision, which is a key activity diagram concept. Upon activity completion, a transition (or set of sequential activities) must be selected from a set of alternative transitions for all use cases.

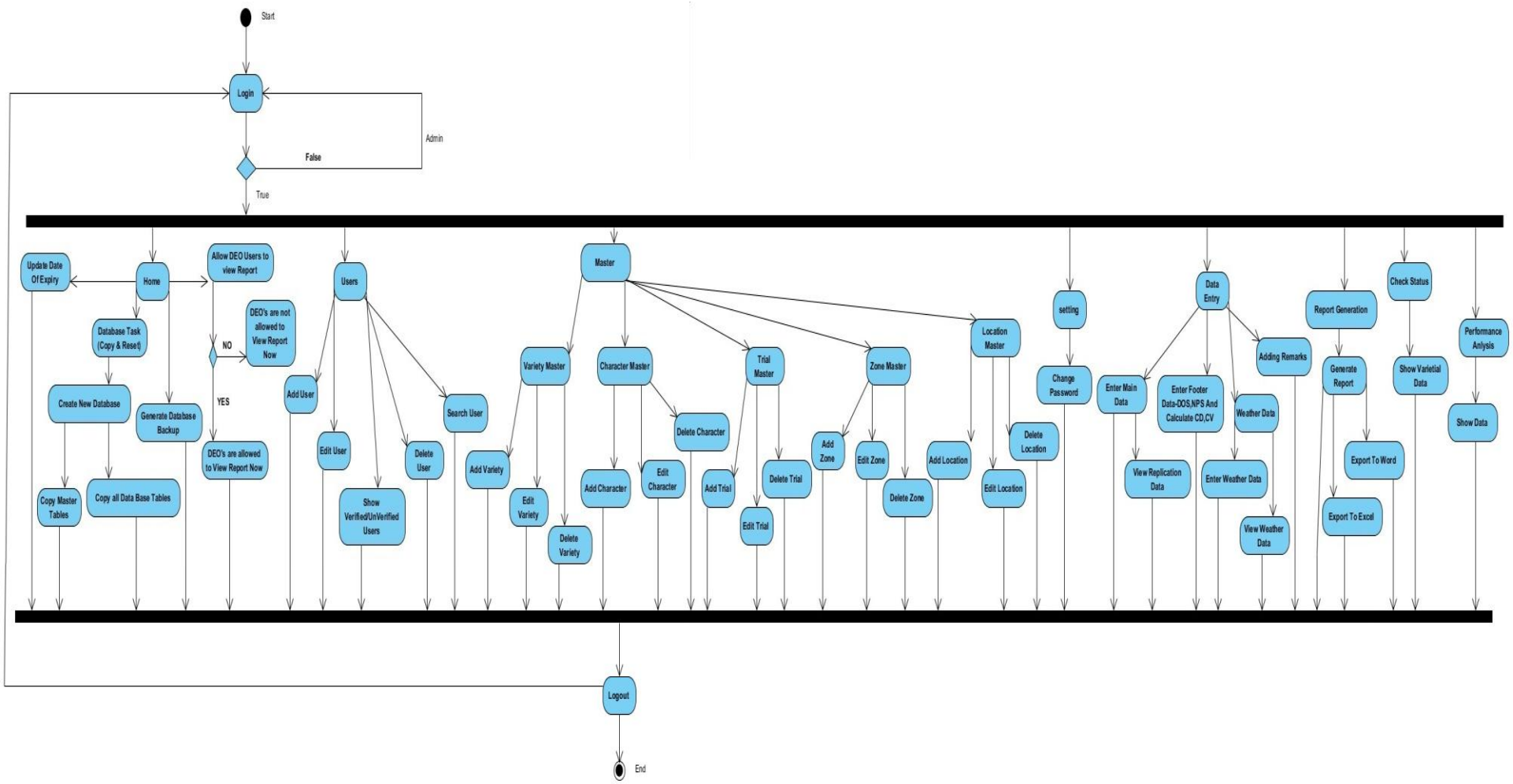


Fig.44 Activity Diagram (Admin)

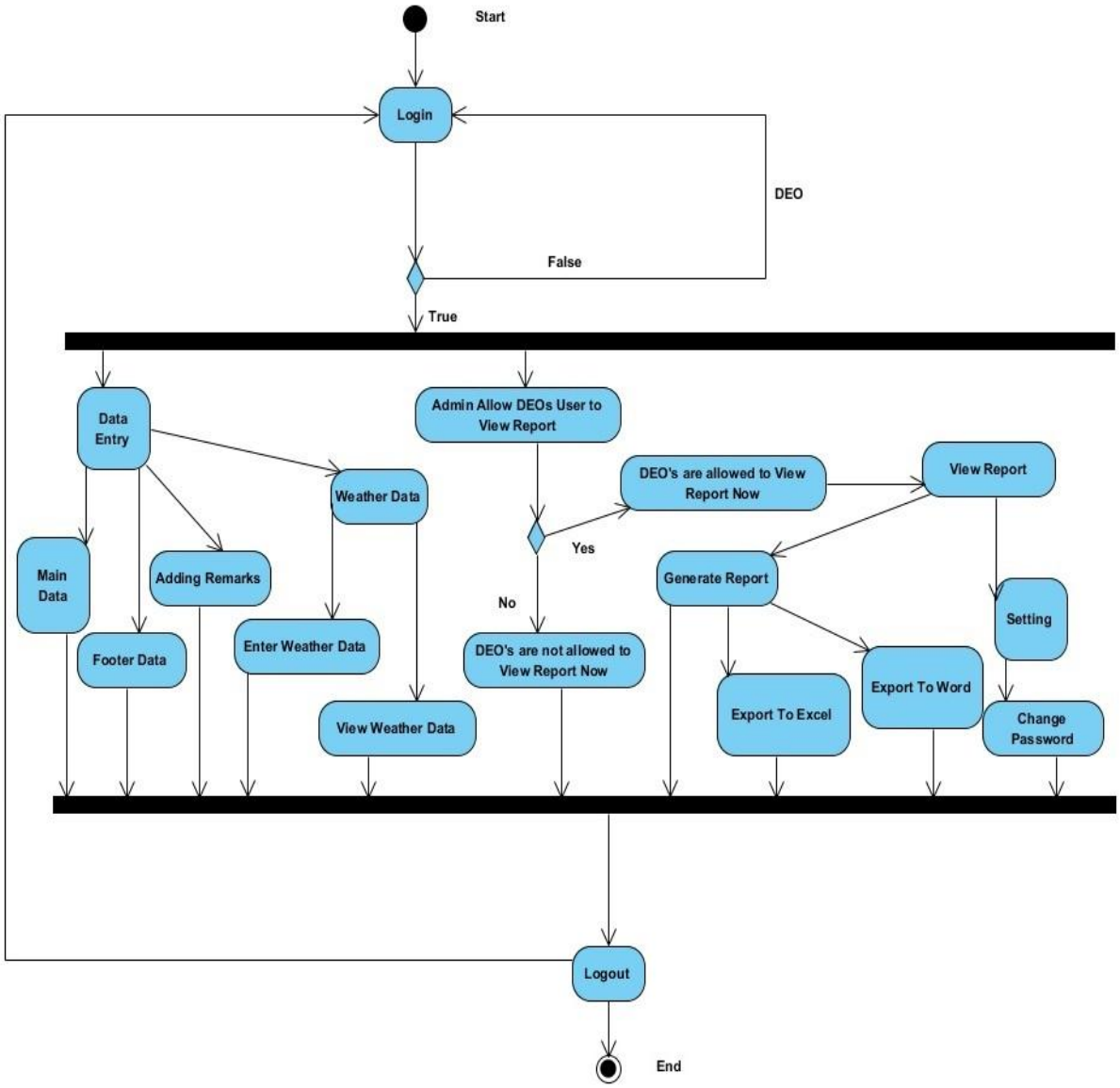


Fig.45 Activity Diagram (DEO)

4.8 Sequence Diagram:-

A sequence diagram, in the context of UML, represents object collaboration and is used to define event sequences between objects for a certain outcome. A sequence diagram is an essential component used in processes related to analysis, design and documentation. A sequence diagram is also known as a timing diagram, event diagram and event scenario.

Object interactions usually begin at the top of a diagram and end at the bottom. In a sequence diagram, object interactions occur through messages on the vertical and horizontal dimensions and are designated by horizontal arrows and message names. The initial sequence diagram message begins at the top and is located on the diagram's left side. Subsequent messages are added just below previous messages. Sequence diagram messages may be subdivided by type, based on functionality.

A lifeline, which indicates a role, is represented by a named rectangular box with a dashed line descending from the center of the diagram's bottom edge. Lifeline boxes represent participating sequence object instances. Blank instance names represent anonymous instances.

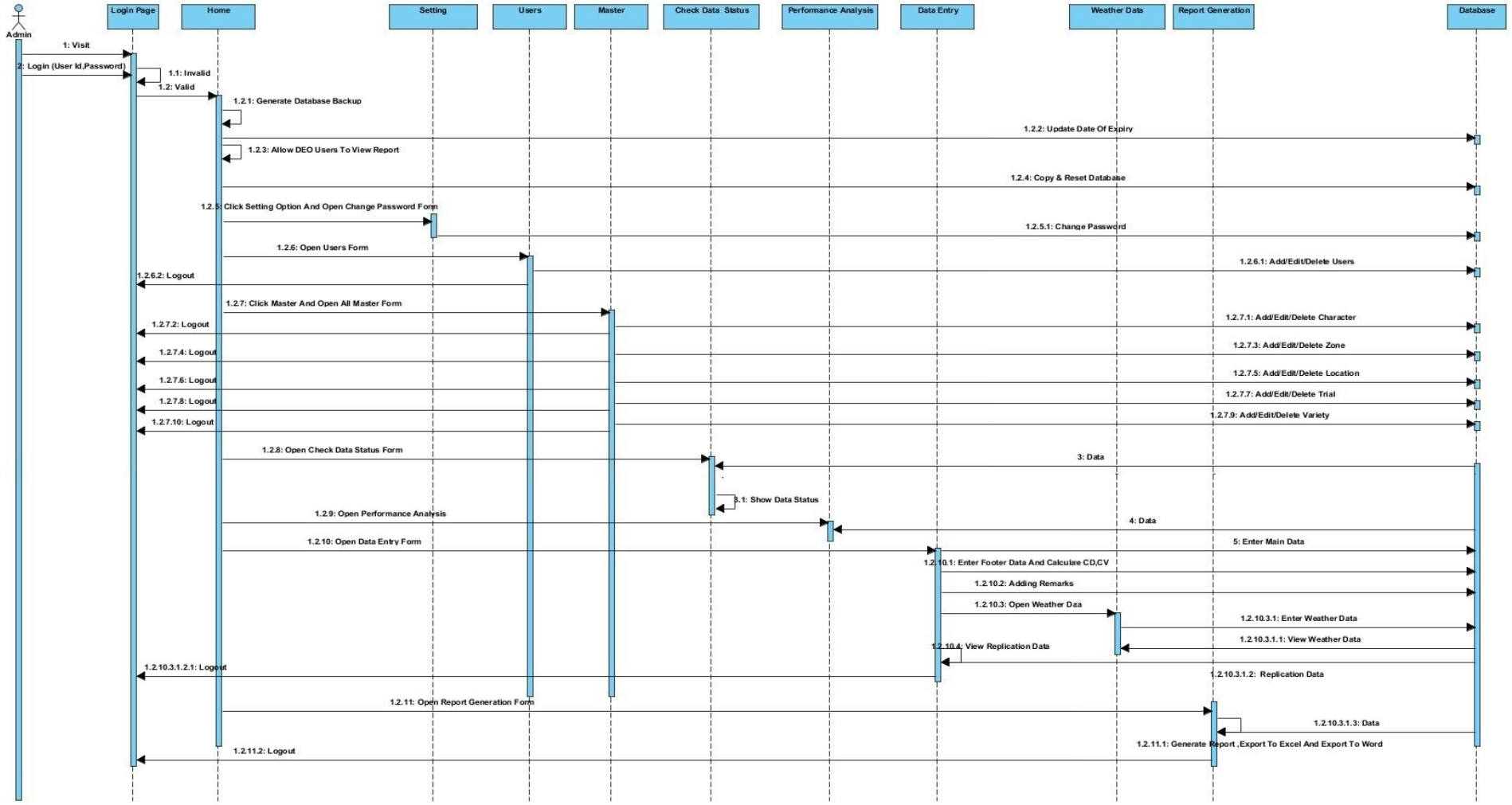


Fig.46 Sequence Diagram (Admin)

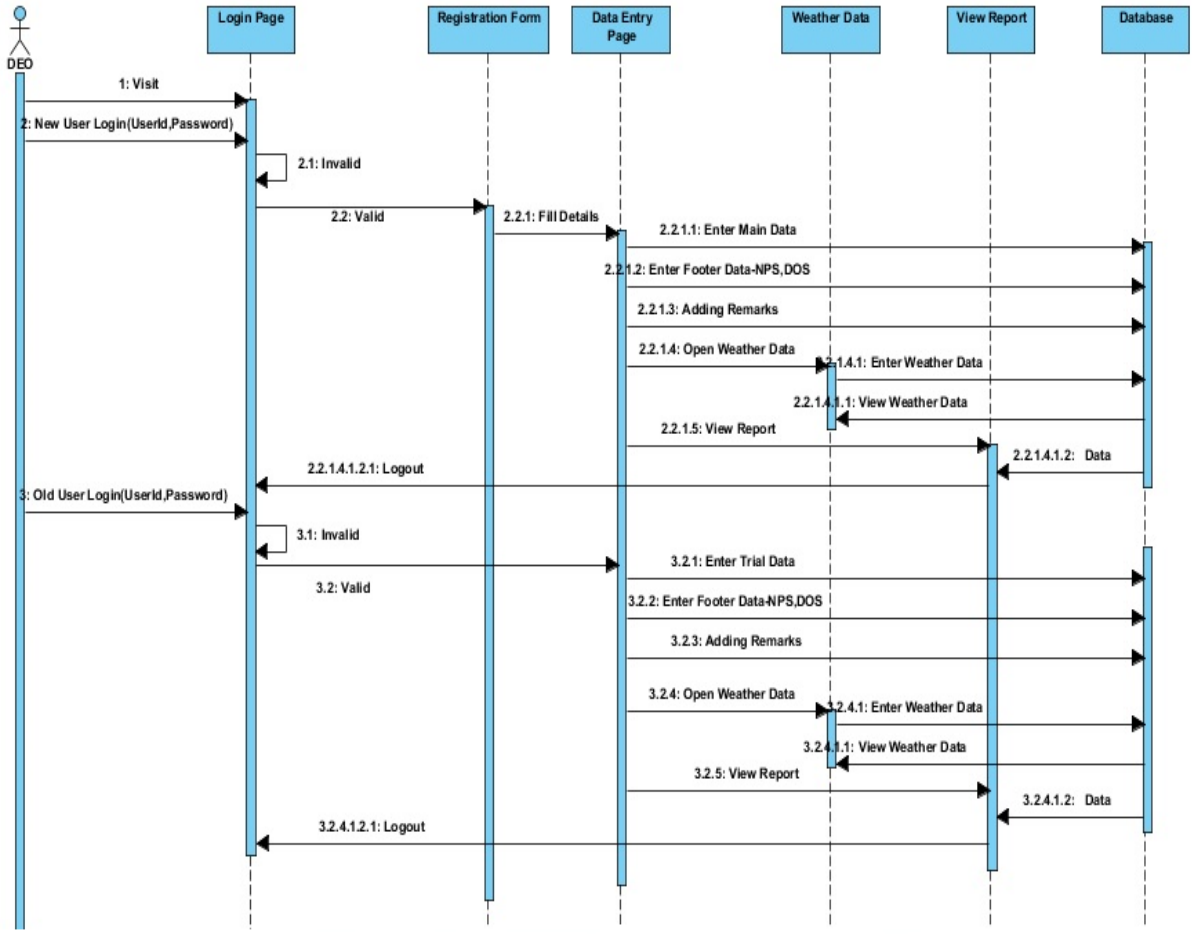


Fig.47 Sequence Diagram (DEO)

Chapter 5

STAGES WHILE OPERATING THE SYSTEM

5.1 Preparation of the system as per the technical program

The system needs to be prepared to get it ready before starting data compilation and report generation tasks as follows.

Case I: If system is used for the first time

1. Initially all the zone names, trials, characters and zone-wise location list are to be entered using the **Master** main menu-option of the main interface as shown below in Fig.48.

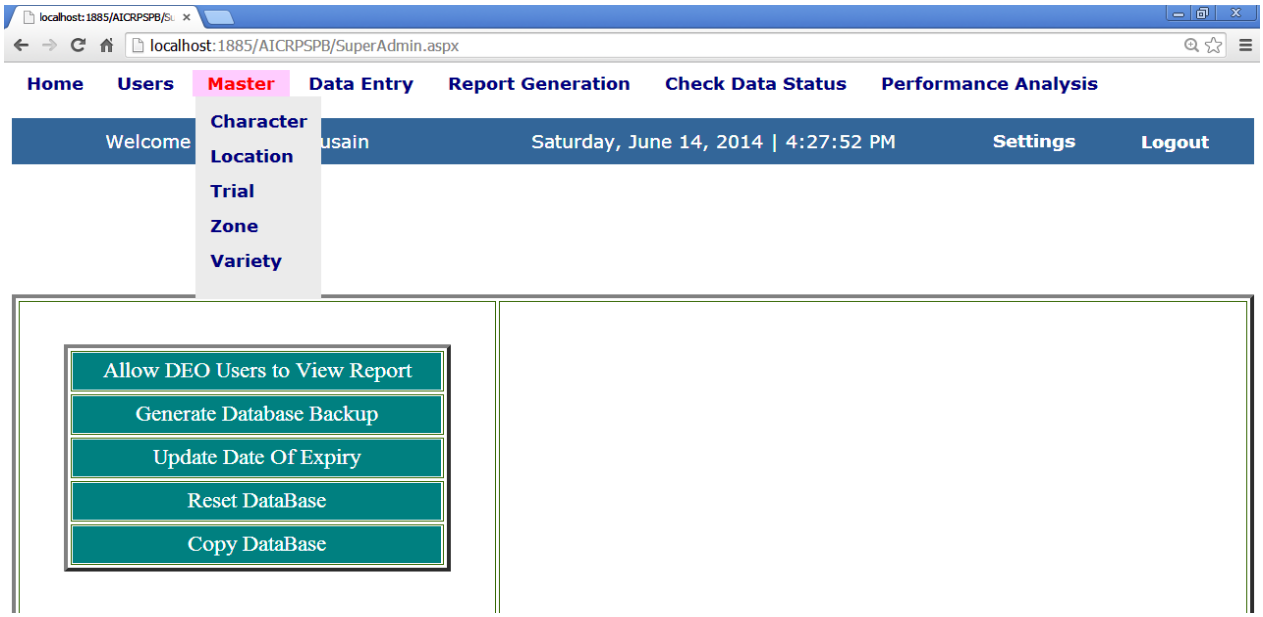


Fig. 48

2. Every year as per the technical program for that year variety list is entered based on zone and trial by using **Variety** option the **Master** main menu-option as shown below in Fig.49.

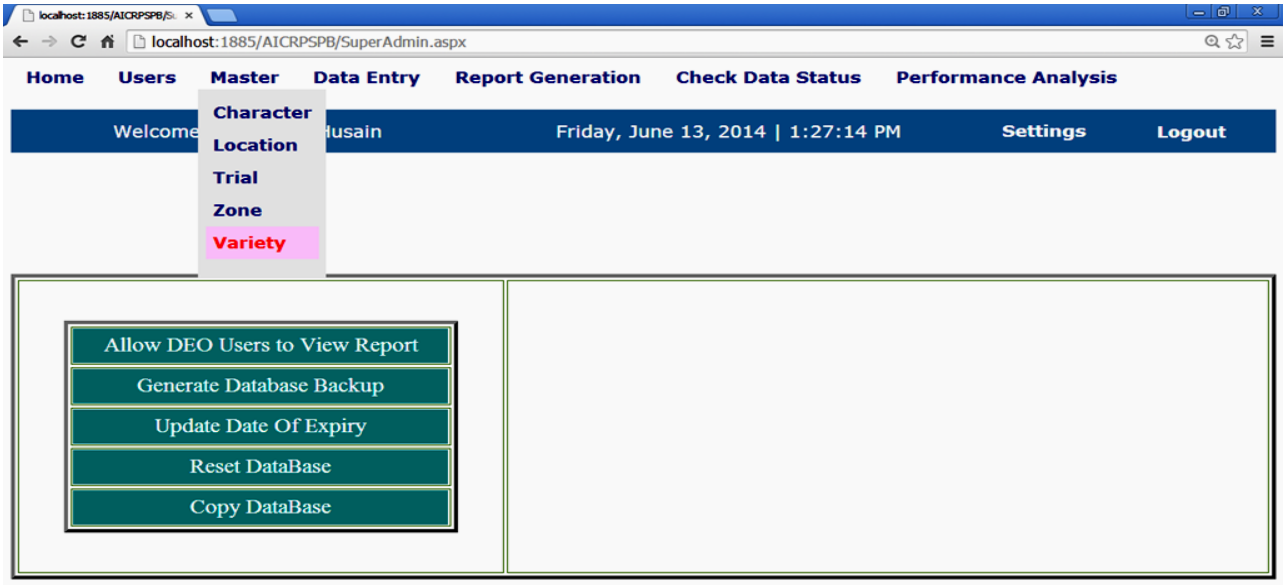


Fig. 49

3. Out of all the varieties some are indicated to be check variety as shown below in Fig.50. These are of special importance to the plant breeders while taking "Varietal" performance decisions during annual AICRPS workshop.

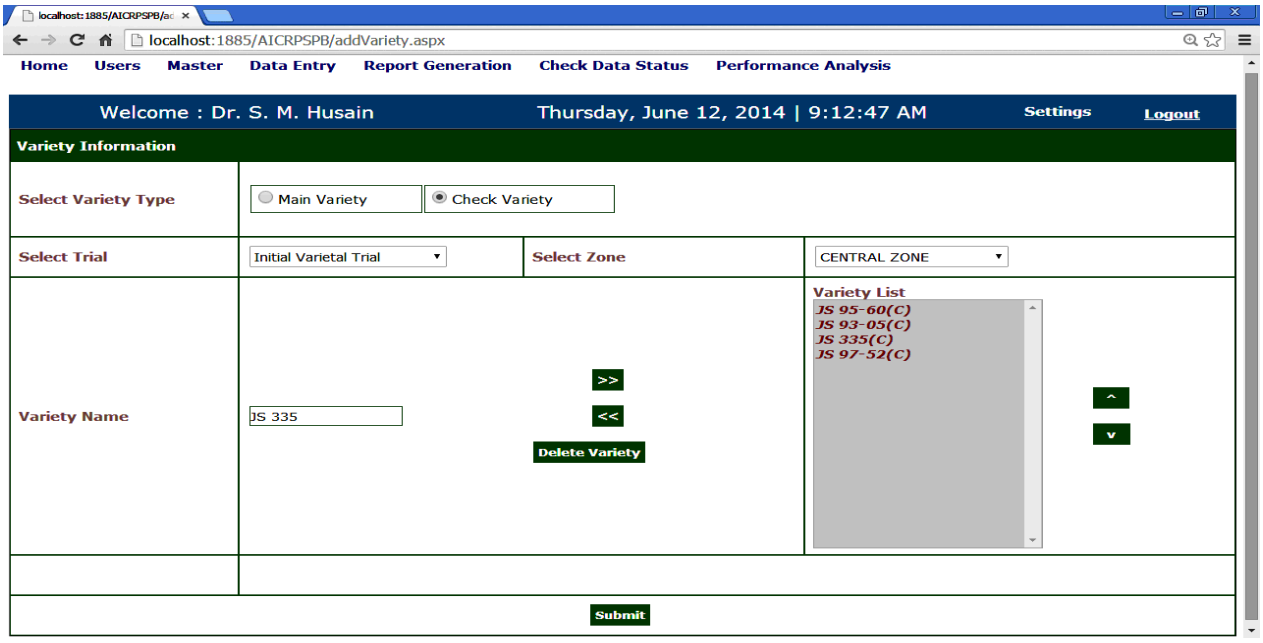


Fig. 50

4. IVT entries are displayed in the form of variety-code on to the Data Entry Operators (DEOs) as show below in Fig.51. Thus all the master tables of the database are made ready for subsequent functionality of the package.

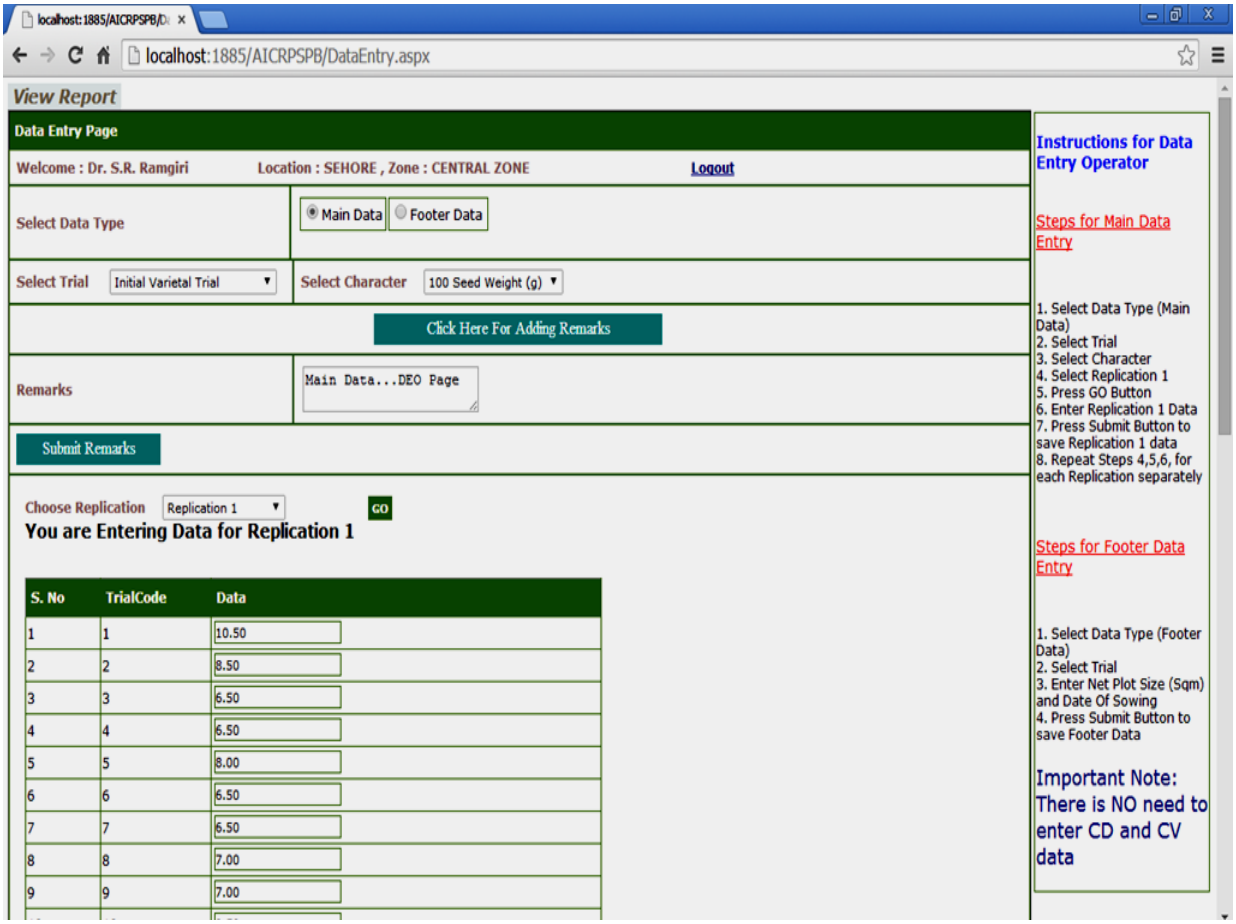


Fig. 51

Case II: If system already has data

1. Follow Steps "3 and 4" of **Case I** for entering names of varieties as per technical program.

5.2 Zone-wise and trial-wise data compilation and Web-Based Data entry:-

Every year, after the cropping season, all the AICRPS in-charges of different centers do data-entry on their own system at their locations instead of sending the printed sheets through post. This is possible using this on-line AICRPS Data Entry software linked to the DSR website. The in-charges have separate user-name and passwords so that they are allowed to enter, edit and access the data of their location only. The data thus entered is stored on remote server of DSR Indore which is further used for report generation. This not only saves the time for getting final data but also reduces the burden of huge volume of data handling on coordinators at DSR Indore.

5.3 Processing of data files:-

After the completion of data-entry, correction of erroneous data, validation of the final data and before the generation of reports, the data files are processed at the system level for calculation of variety-wise mean, location-wise mean (for yield character) and varietal performance ranking. Based on these ranks as shown in the final reports, decisions on better performance of varieties are taken.

5.4 Efficient error handling:-

The system has been designed in such a way that data-entry operator is not given any chance to commit any error. The user interface is such that most of the inputs are provided to the system through selections from a list with more than one valid option. Efficient error handling procedures are used so that if, by chance, any wrong entry is done, it will alert the user by promptly producing error messages. Even before every update/delete operation a confirmation massage is prompted on user's screen in order to ensure final changes in the database at DSR Indore's server. The user interface is such that even a novice user with less computer skills can also handle the system comfortably.

5.5 Data analysis and Report Generation:-

After the completion of the data-entry and processing tasks, the summary table reports for each zone and trials for all characters are taken out. The printed computer reports for all the zones are scrutinized briefly by data processing staff for recording errors that have not been trapped by validation at the input stage. This is done by physically matching the data on computer-generated reports to the original data sheets. The erroneous jobs are edited by them and submitted for rerunning. The reports again generated are then referred to the trials coordinators for subsequent correction at their stage. After complete correction of errors at different levels by coordinators, final reports are produced in formats specified by the AICRPS coordinators using, where possible, computer procedures, which will produce reports in a standard format. More complex and non-standard reports are produced using a combination of Report Generation menu-option and word-processing viz. MS-Word and spread sheet packages like MS-Excel. This provides a more versatile approach to report production than customized computer procedures.

5.6 Creating history database files:-

Looking for the safety of overall database and its easy access after a long period of gap as and when required, system has a provision to create history database files. The complete database with all the tables in it can be stored in the form of backup files, which can be restored and linked to the system, as and when required for getting information, in future. The structure of the history databases is same as the original database when it is restored from the backup files.

5.7 Monitoring all the phases of the system:-

The System administrator can give access rights to different breeders with different permissions as an administrator and data-entry-operator. The administrator monitors every phase of the system from Master table data-entry as per the technical program up to final report generation.

Chapter 6
INPUT/OUTPUT FORMS AND THEIR PURPOSES

- **Zone Entry Form -** This form is used for adding information of different Zones with the help of Zone Name and Zone Code textboxes provided in "ZONE INFORMATION FORM" as shown below in Fig.52.

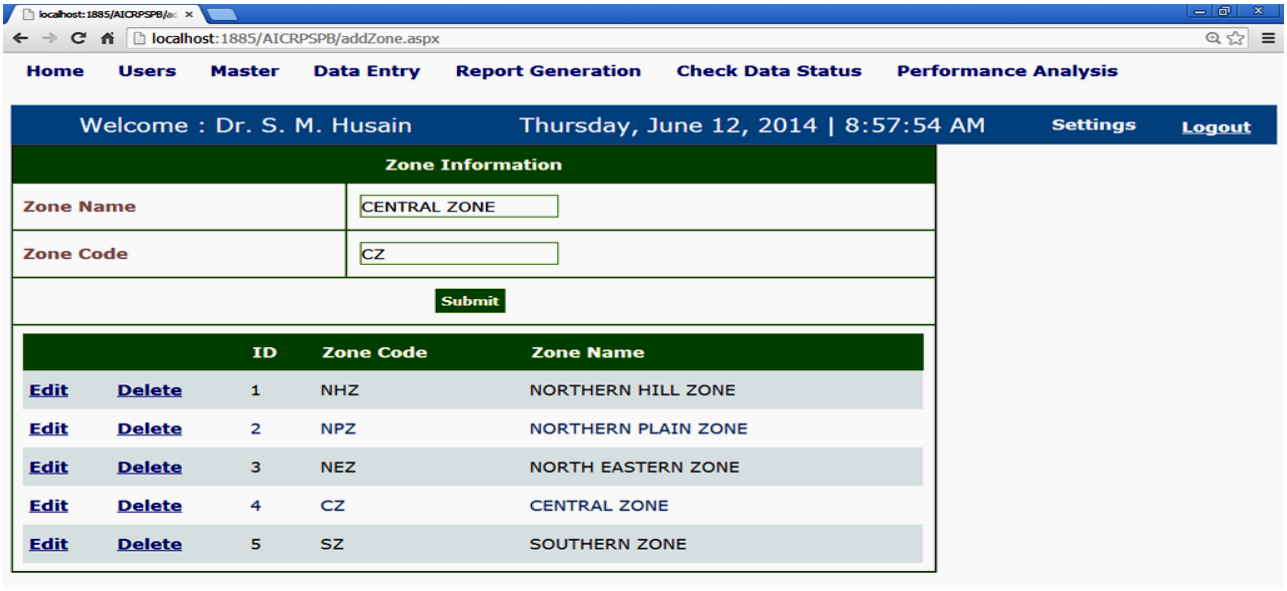


Fig. 52 ZONE INFORMATION FORM

- **Trial Entry form -** This form is used for adding information of various Trials with the help of Trial Name and Trial Code and Number of Replicas textboxes provided in "TRIAL INFORMATION FORM" as shown below in Fig.53.

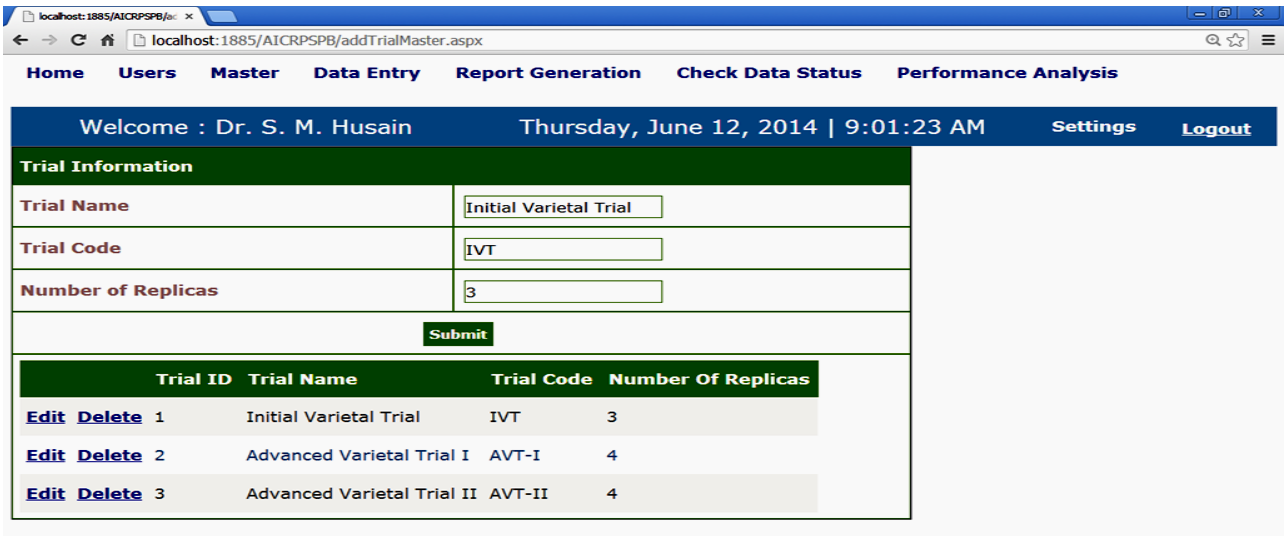


Fig. 53 TRIAL INFORMATION FORM

- **Character Entry Form –** This form is used for adding information of various Characters with the help of Character Name textbox provided in "CHARACTER INFORMATION FORM" as shown below in Fig.54.

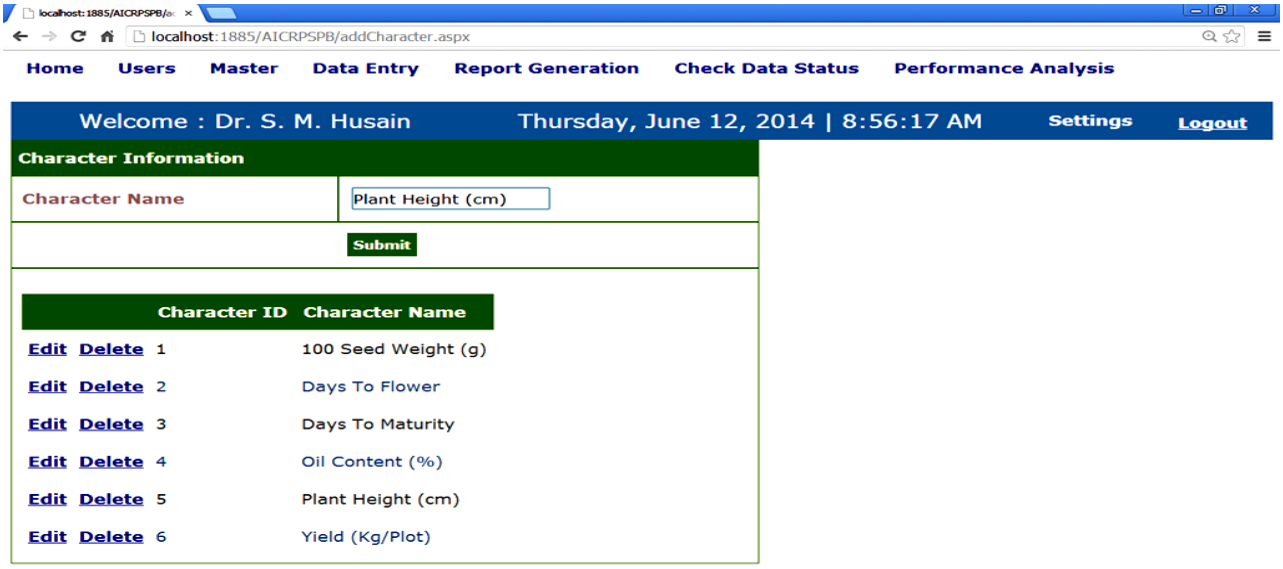


Fig. 54 CHARACTER INFORMATION FORM

- **Location Entry Form -** This form is used for adding information of various Locations with the help of Select Zone combo box and Location Name textbox provided in "LOCATION INFORMATION FORM" as shown below in Fig.55.

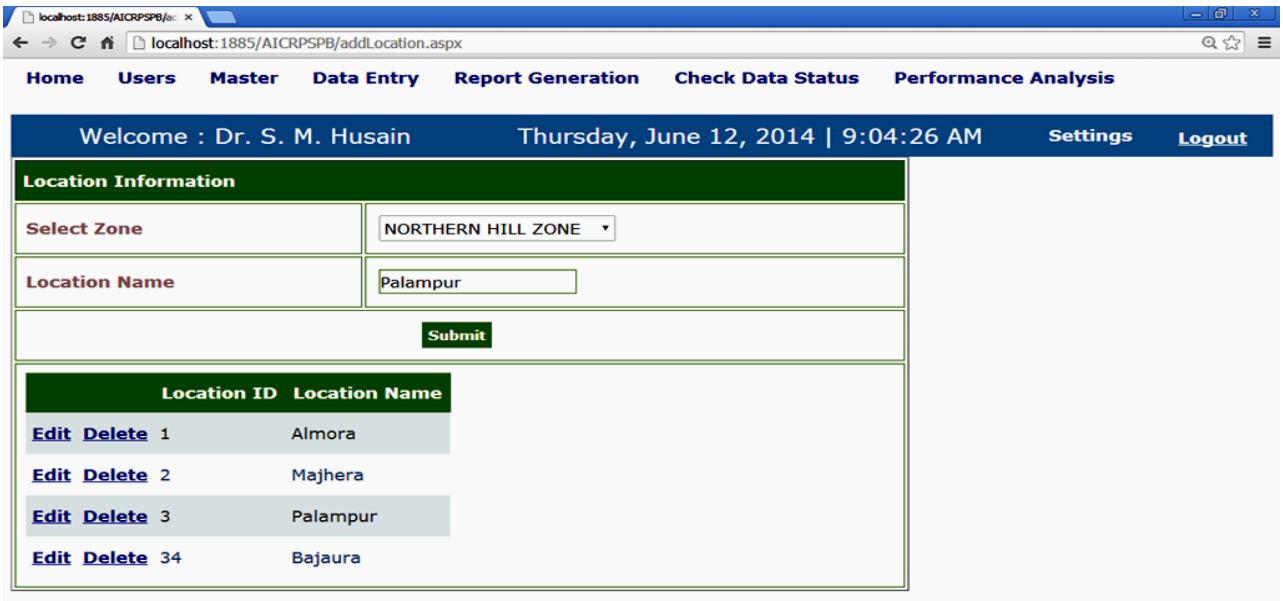


Fig. 55 LOCATION INFORMATION FORM

- **Main Variety Entry Form -** This form is used for adding information of various Main Varieties of different trial of a particular zone with the help of Select Variety Type radio-button and Select Trial, Select Zone combo-box and Variety Name textbox provided in "Main – VARIETY INFORMATION FORM" as shown below in Fig.56.

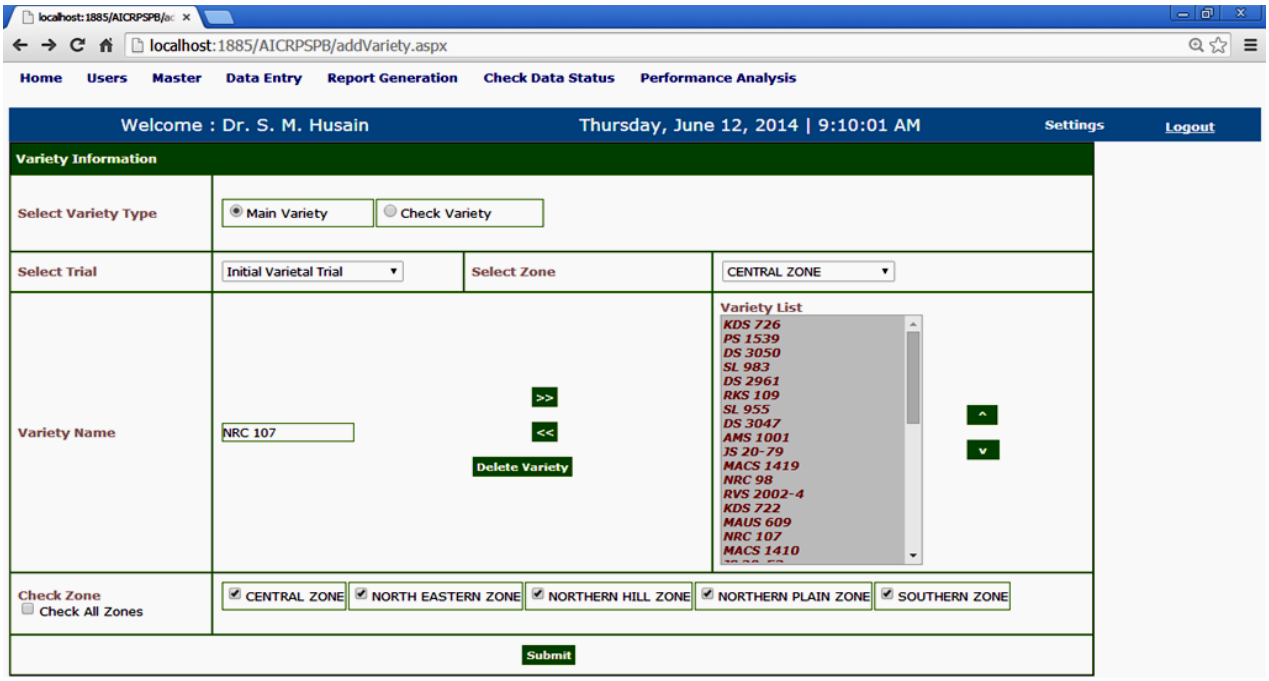


Fig.56 Main - VARIETY INFORMATION FORM

- **Check Variety Entry Form -** This form is used for adding information of various Check Varieties of different trial of a particular zone with the help of Select Variety Type radio-button and Select Trial, Select Zone combo-box and Variety Name textbox provided in "Check -VARIETY INFORMATION FORM" as shown below in Fig.57.

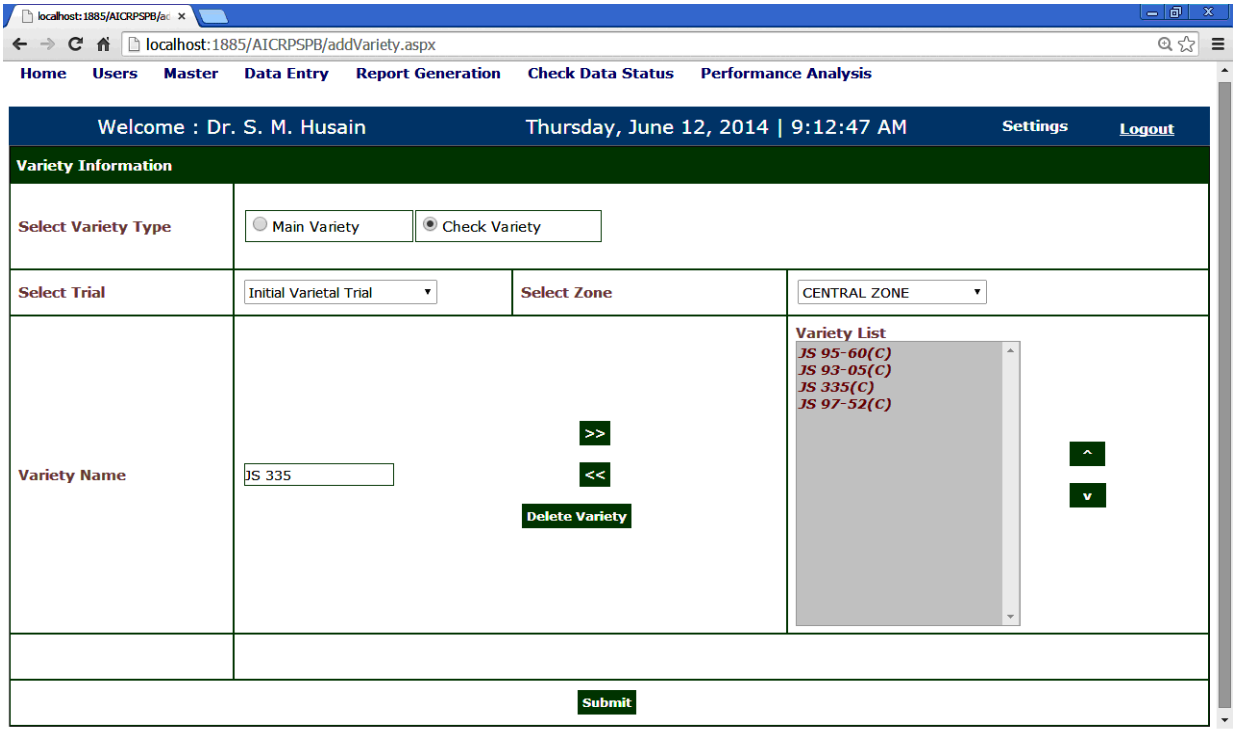


Fig.57 Check - VARIETY INFORMATION FORM

- **Main Data Entry Form -**This form is used for entering data of different Varieties of a particular Location with the help of Select Data Type radio-button and Select Location, Select Trial, Select Character, Choose Replication combo-box provided in "Main - DATA ENTRY PAGE" as shown below in Fig.58.

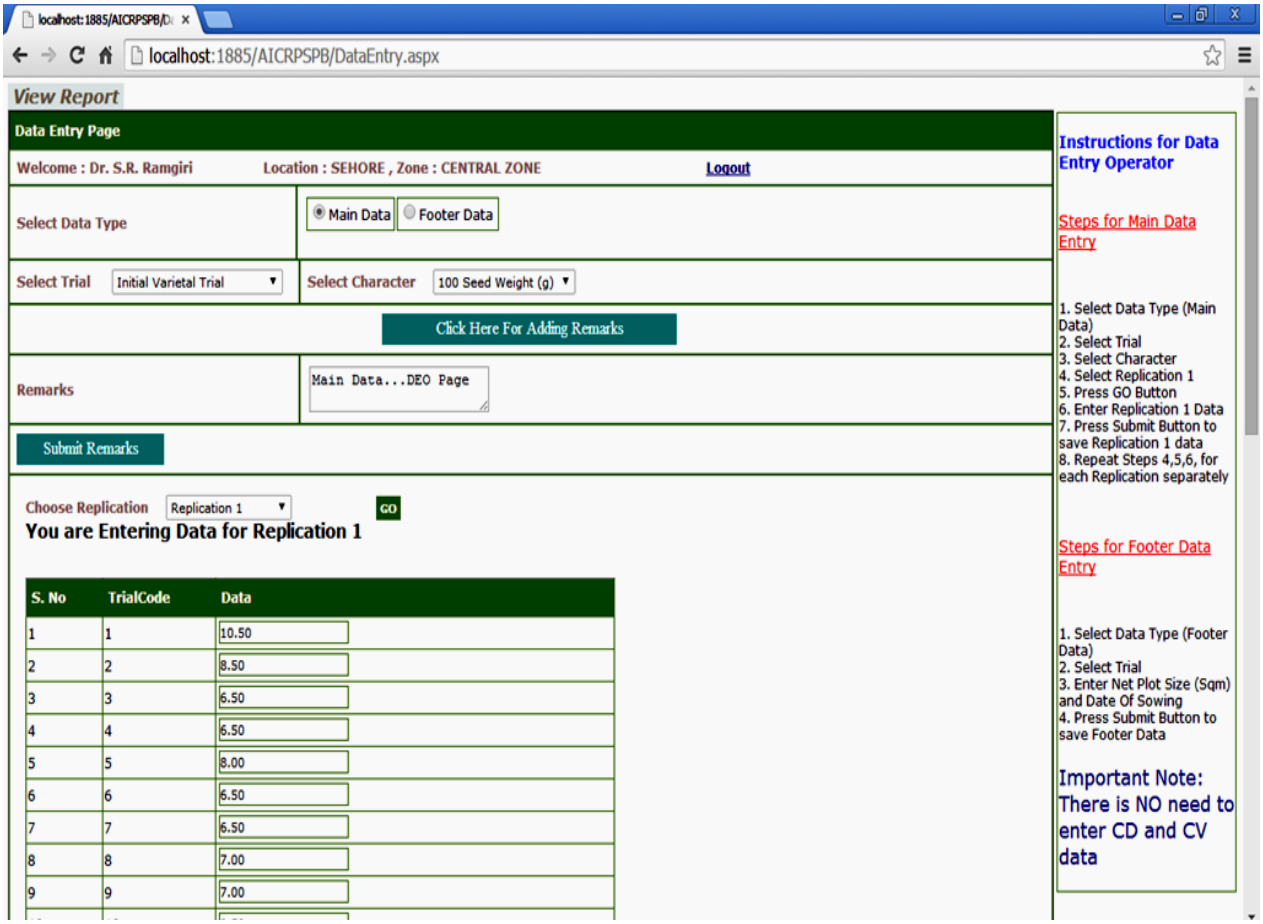


Fig.58 Main - DATA ENTRY PAGE

- **Footer Data Entry Form -** This form is used for entering data of different Varieties of a particular Location with the help of Select Data Type radio-button and Select Location, Select Trial combo-box and Net Plot Size (sqm), Date Of Sowing textbox (used by Data Entry Operator) and C.D. at 5%, C.V. (%) text box (used by Administrator) provided in "Footer - DATA ENTRY PAGE" as shown below in Fig.59.

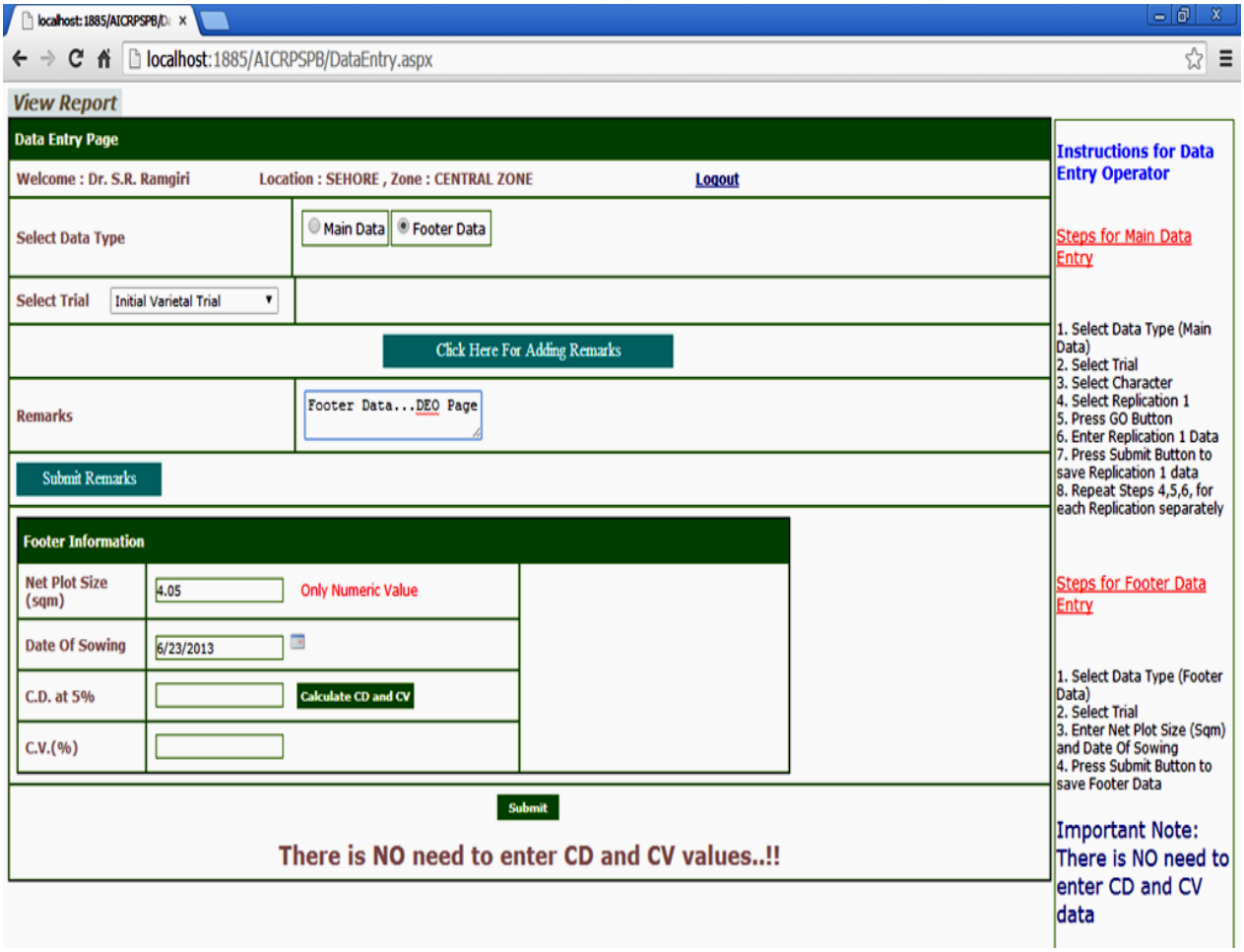


Fig. 59 Footer - DATA ENTRY PAGE

- **New User Registration Form (step 1) -** This form is used by un-registered users who is using this software for the first time, to register by filling required details in appropriate field provided in "NEW USER REGISTRATION PAGE(step 1)" as shown below in Fig.60.

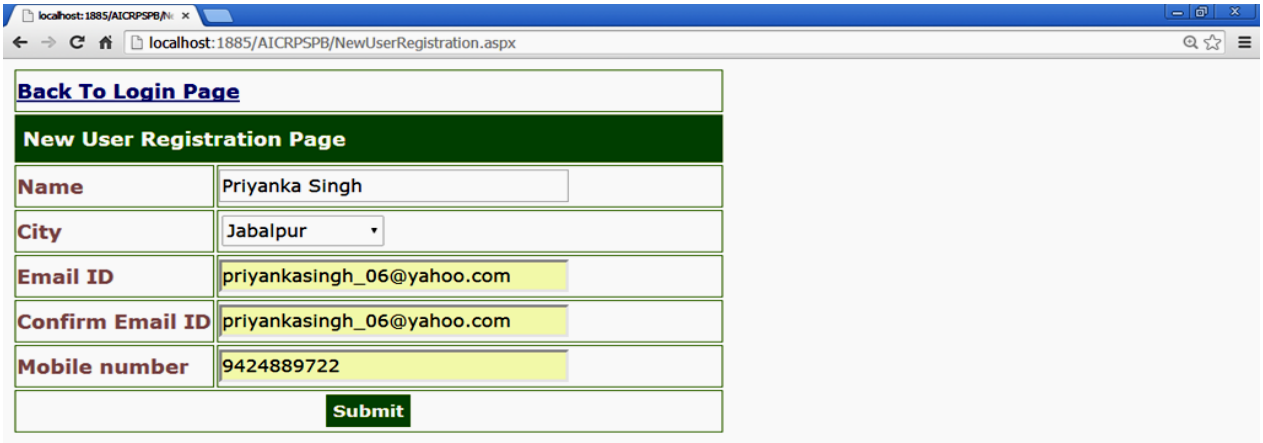


Fig.60 NEW USER REGISTRATION PAGE (step 1)

- **New User Registration Form (step 2) -** This form is used by un-registered users who is using this software for the first time by filling required details in the appropriate field provided in "NEW USER REGISTRATION PAGE(step 2)" as shown below in Fig.61.

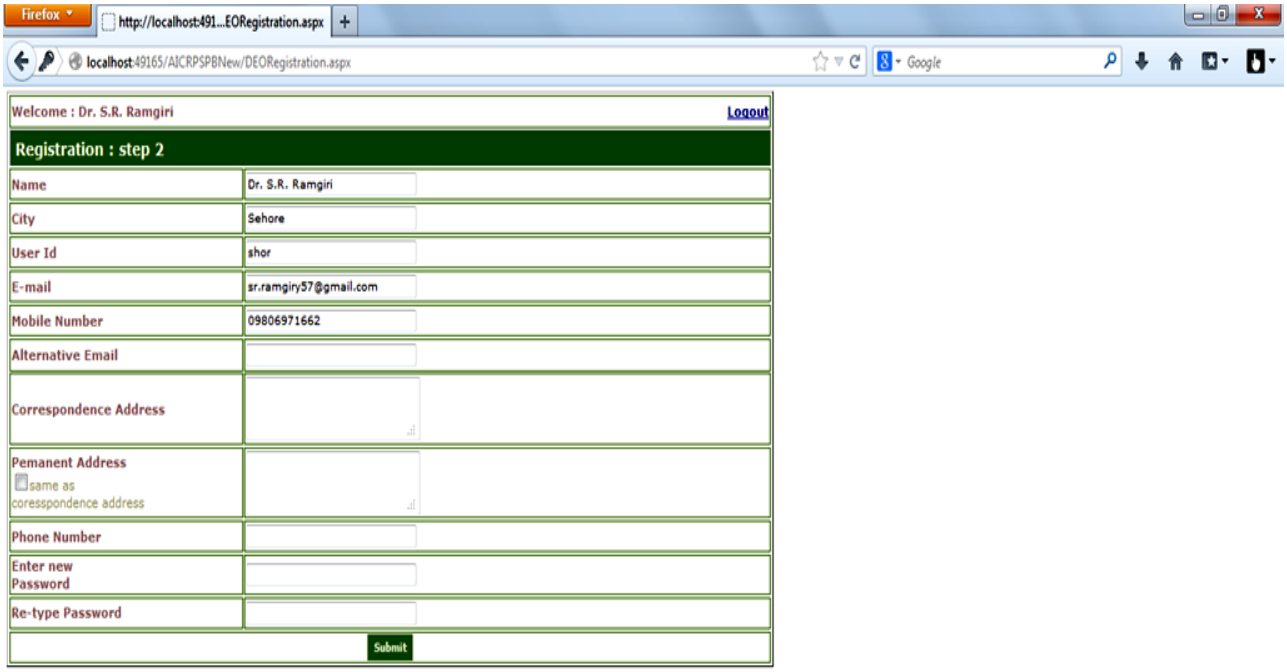


Fig.61 NEW USER REGISTRATION PAGE (step 2)

- **User Information Form –** This form is administrator to add new user's information by filling required details in the appropriate fields provided in "USER INFORMATION FORM**"** as shown below in Fig.62.

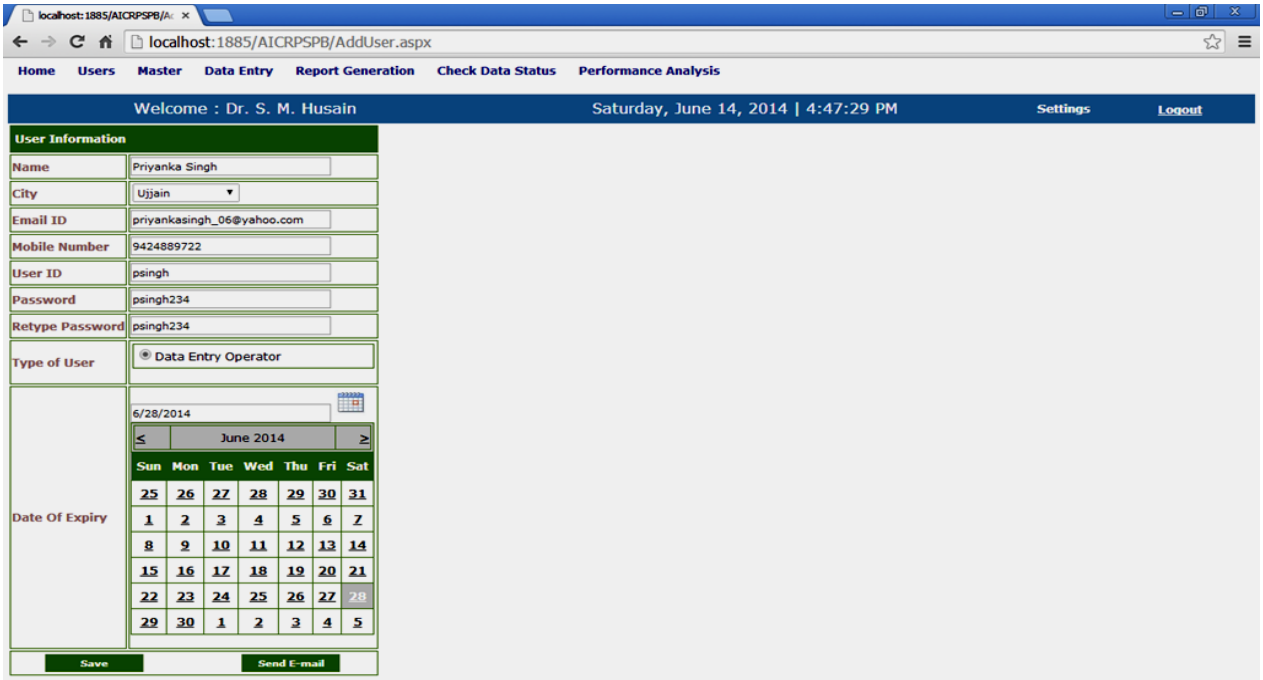


Fig. 62 USER INFORMATION FORM (Add New User by Admin)

➢ **Edit - User Information Form –** This form is administrator to edit existing user's information by editing required details in the appropriate fields provided in "Edit - USER INFORMATION FORM" as shown below in Fig.63.

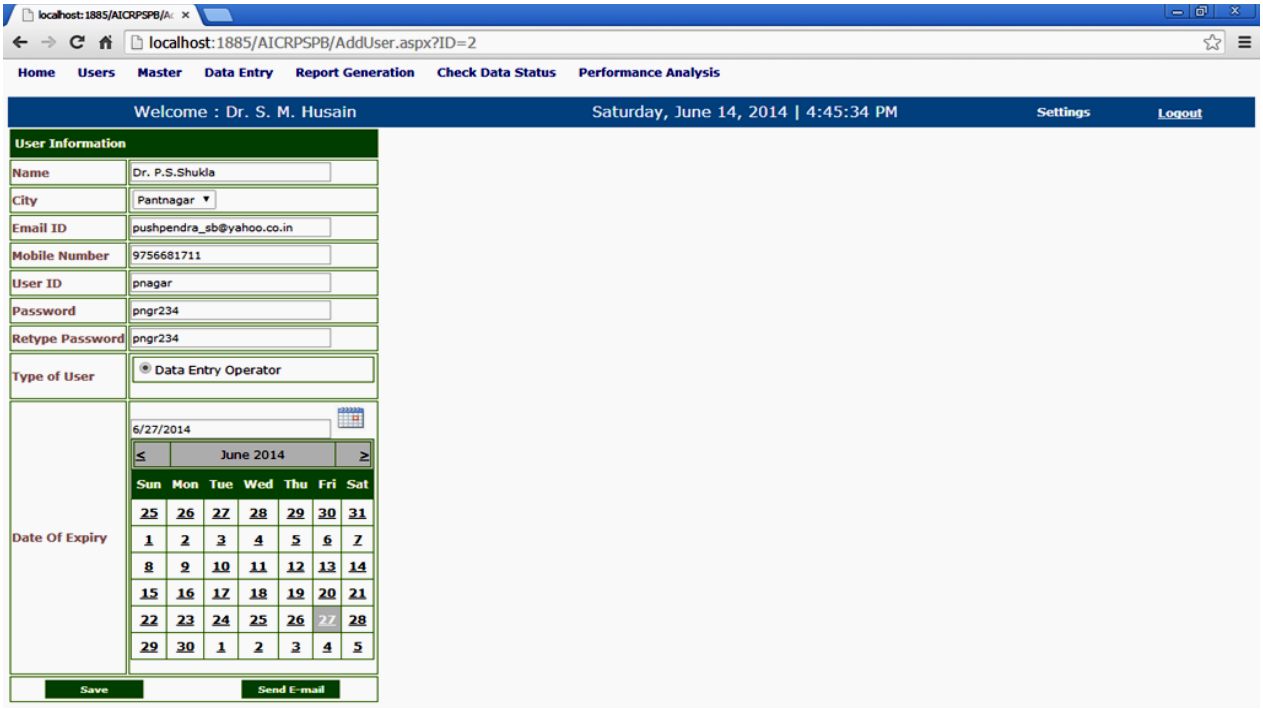


Fig.63 Edit - USER INFORMATION FORM (ADMIN)

➢ **Forgot Password Form –** This form is used by the users if they forget their password by filling required details provided in "FORGOT PASSWORD FORM" as shown below in Fig.64.

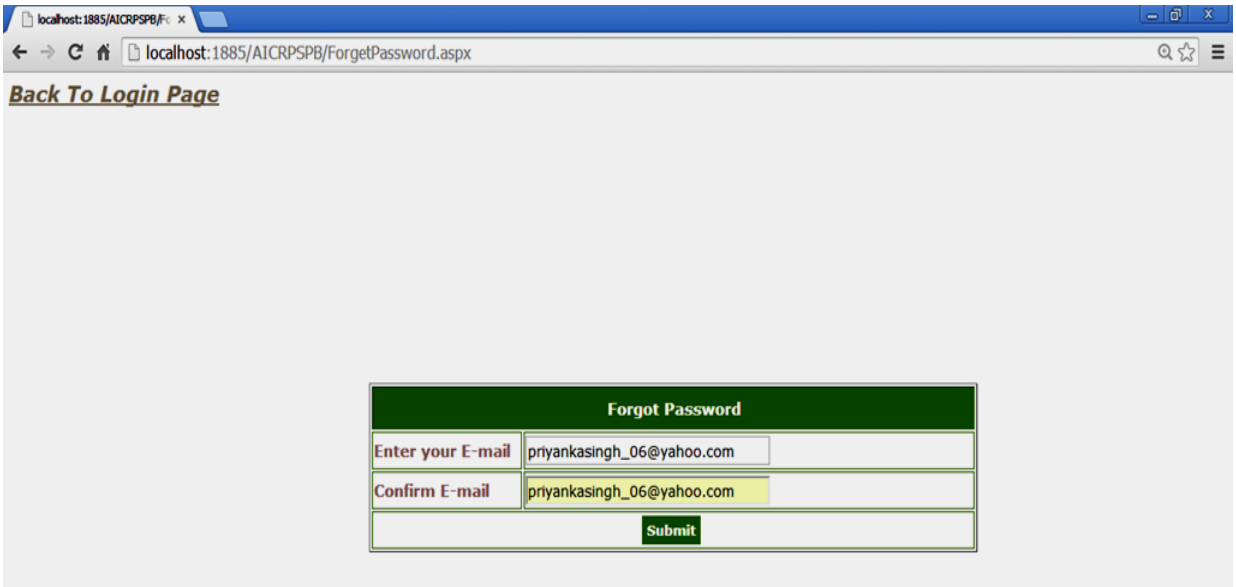


Fig.64 FORGOT PASSWORD FORM

- **Change Password Form -** This form is used by the users if they want to change their password by filling required details provided in "CHANGE PASSWORD FORM" as shown below in Fig.65.

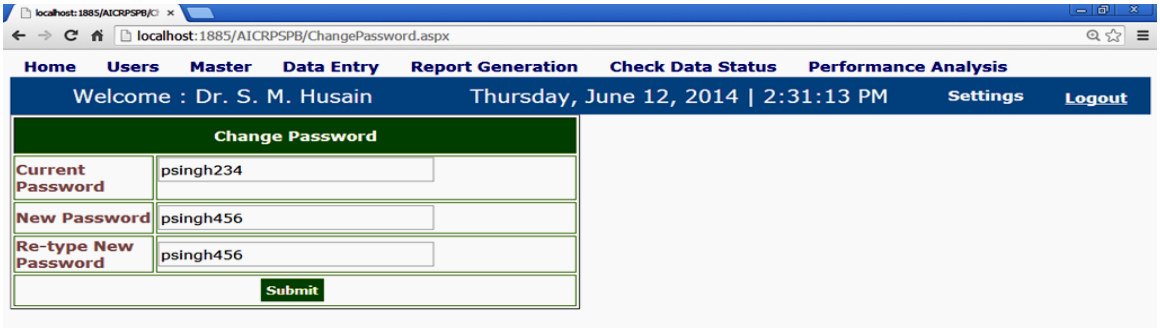


Fig.65 CHANGE PASSWORD FORM

- **Report Generation Form –** This form is used by the administrator for the generation of final report with the help of Select Trial, Select Zone and Select Character combo-box, GO, "Generate Report" and "Export To Excel" button provided in "REPORT GENERATION FORM" as shown below in Fig.66.

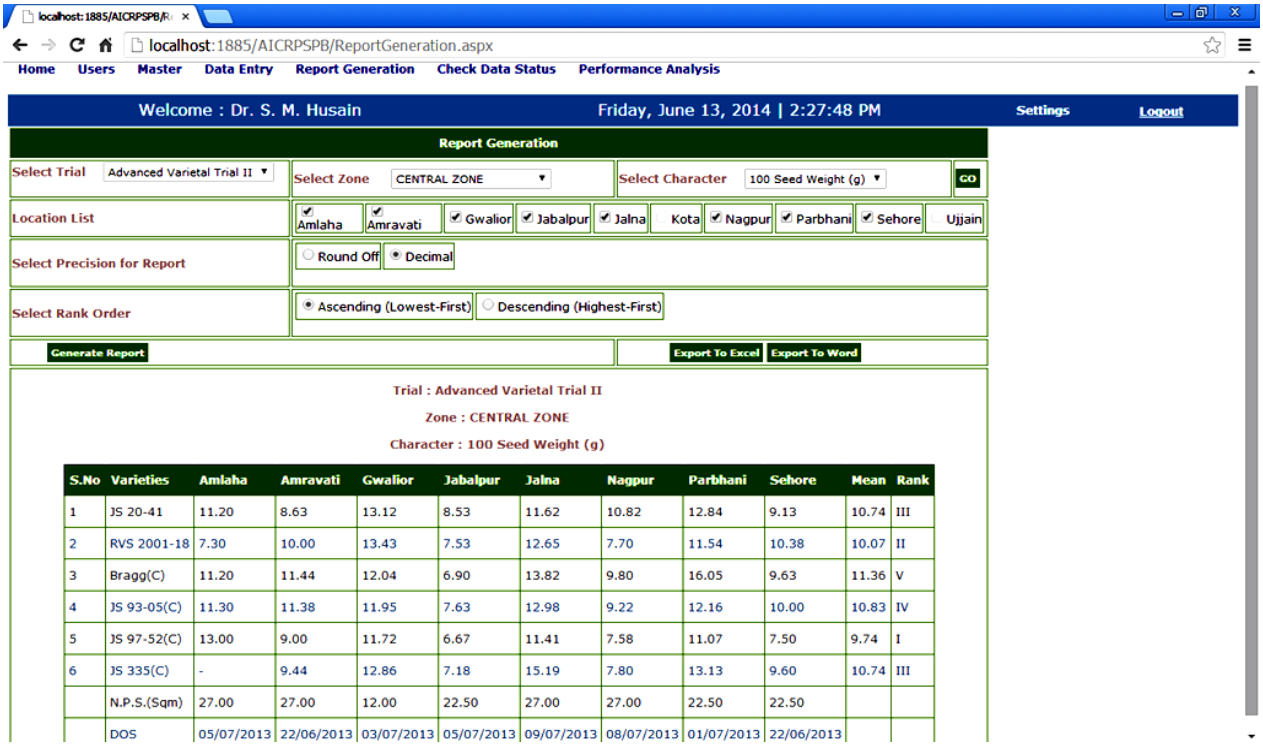


Fig. 66 REPORT GENERATION FORM

- **Show Data Status Form –** This form is used by the administrator to view the status of data entered by DEOs from different locations with the help of Select Zone, Select Trial and Select Character combo-box and GO button provided in "Show Data Status Form" as shown below in Fig.67.

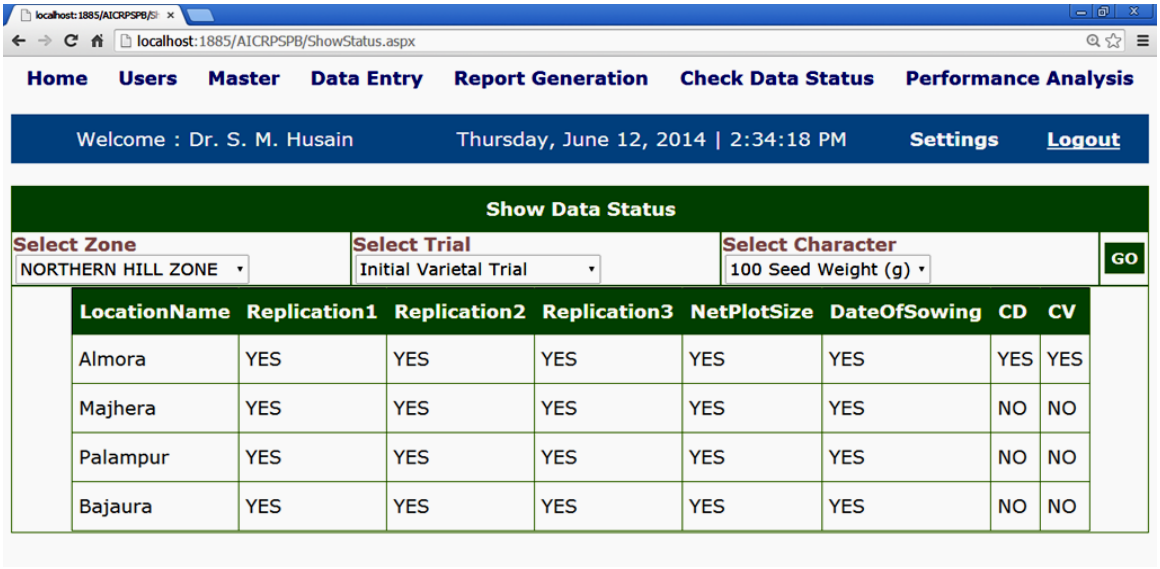


Fig.67 Show Data Status Form

➢ **Show User Form –** This form is used by the administrator to search a particular User (DEO) by first name, last name or middle name with the help of Enter UserName textbox, provided in "Search User Form" as shown below in Fig.68.

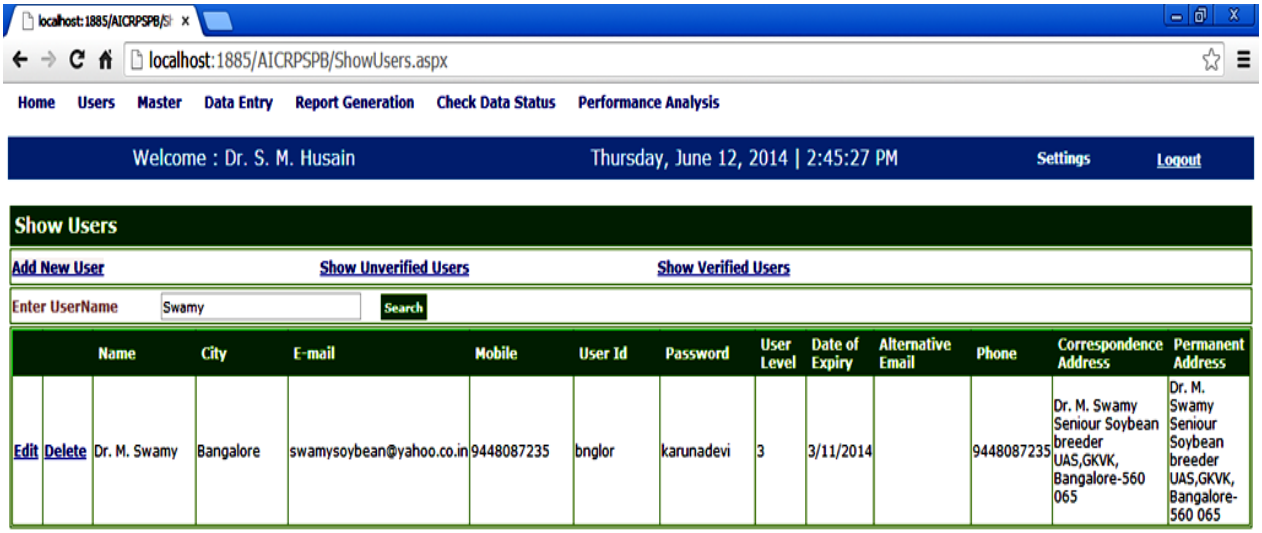


Fig.68 Search User Form

➢ **Show Verified Users Form –** This form is used by the administrator to view the list of users who have started using the system by completing the Step 2 of User Registration process with the help of Show Verified User hyperlink, provided in "Show Verified Users Form" as shown below in Fig.69.

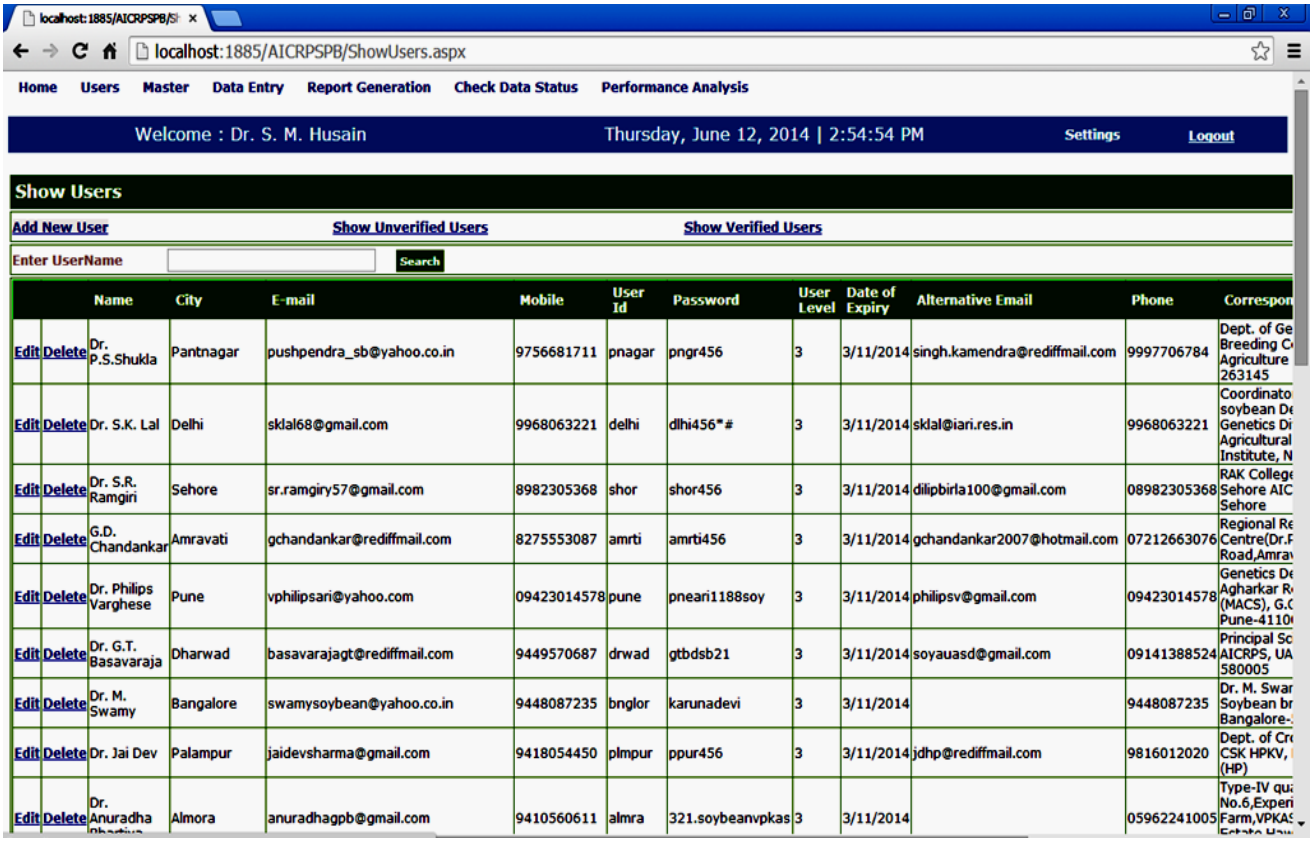


Fig.69 Show Verified Users Form

➢ **Show Unverified Users Form –** This form is used by the administrator to view the list of users who have not yet started using the system by completing the Step 2 of User Registration process with the help of Show Unverified User hyperlink, provided in "Show Unverified Users Form" as shown below in Fig.70.

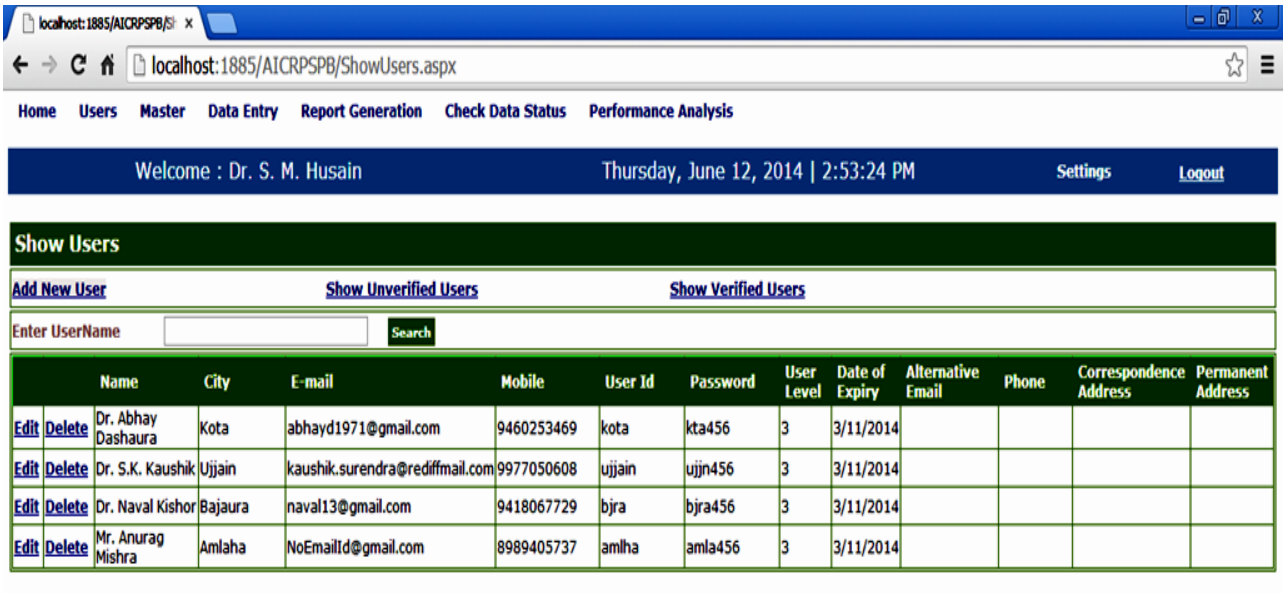


Fig.70 Show Unverified Users Form

➢ **Allow DEO Users to View Report Utility –** This utility is used by the administrator to grant rights to DEOs to only view the report generated by the software without being able to edit the report with the help of Allow DEO Users to view Report button in the Home page of administrator, as shown below in Fig.71.

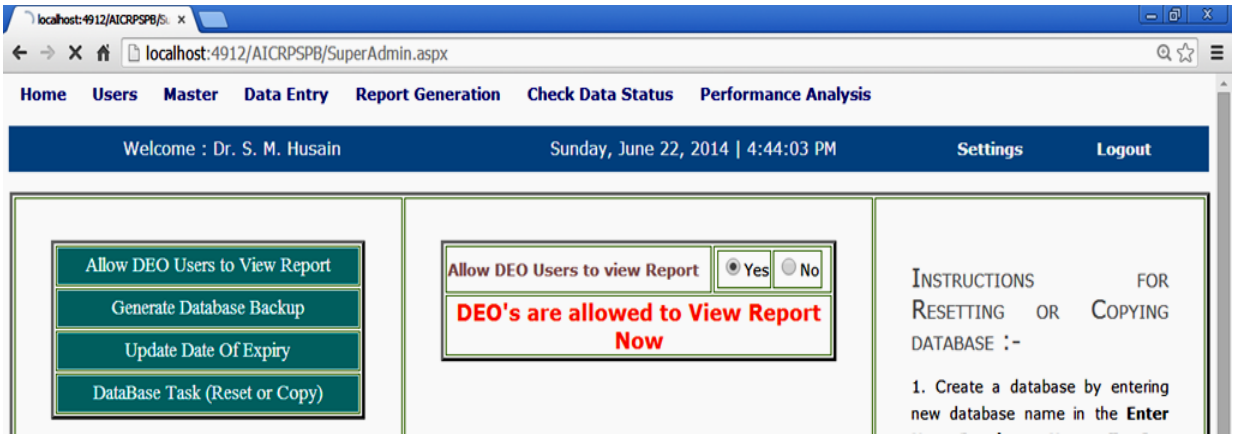


Fig.71 Allow DEO Users to View Report Utility

➢ **Generate Database Backup Utility –** This utility is used by the administrator to generate backup of the current database, for future use, with the help of Generate Database Backup button in the Home page of administrator, as shown below in Fig.72.

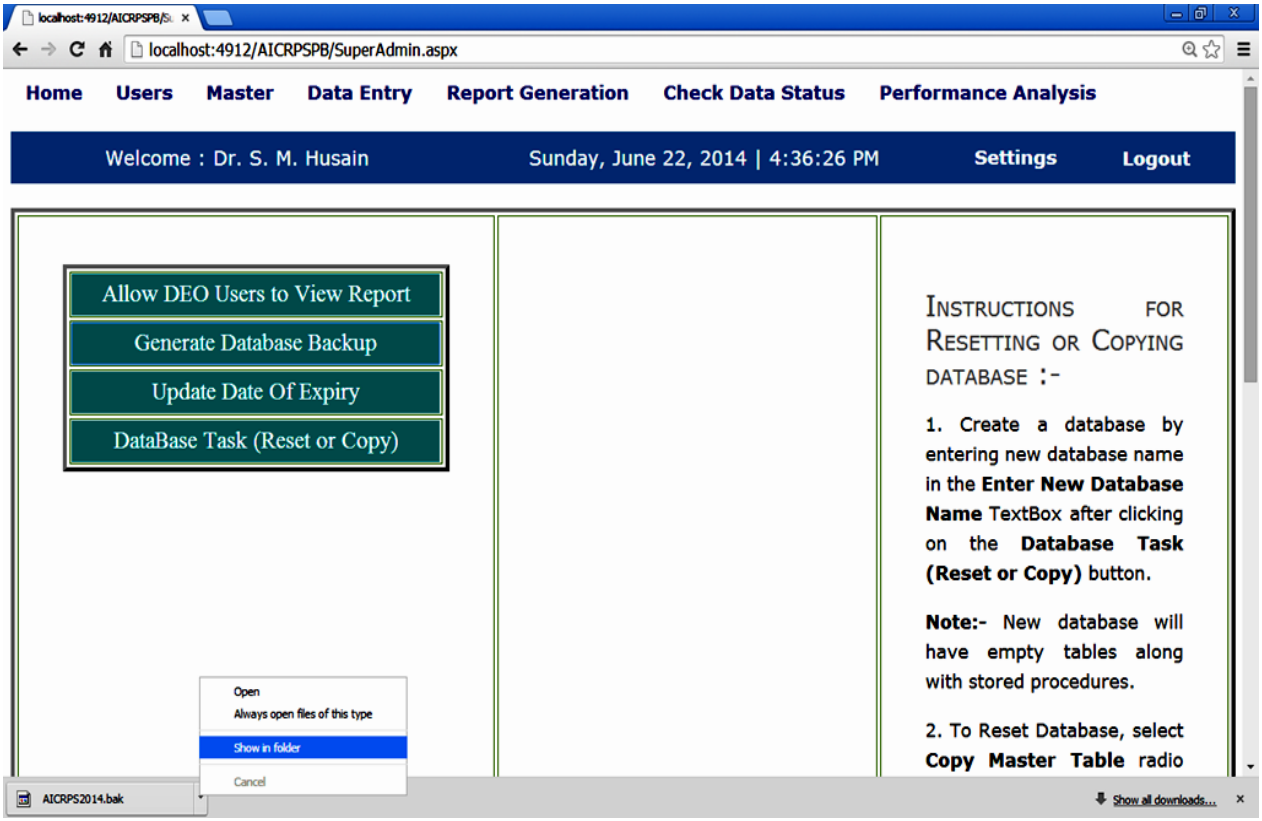


Fig.72 Generate Database Backup Utility

➢ **Update Date of Expiry Utility –** This utility is used by the administrator to update date of expiry of data entry by the DEO of different location with the help of Update Date of Expiry button in the Home page of administrator, as shown below in Fig.73.

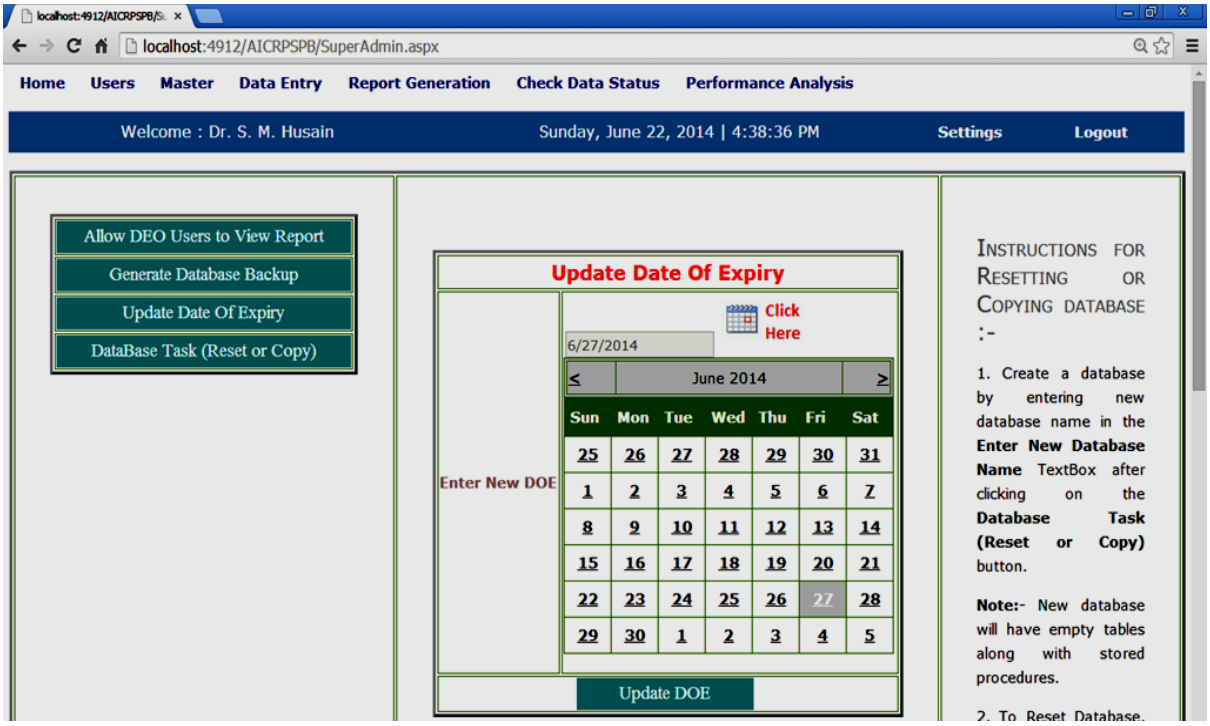


Fig.73 Update Date of Expiry Utility

➢ **Reset Database Utility –** This utility is used by the administrator to reset the existing database and filling only the master tables with the help of DataBase Task button in the Home page of administrator, as shown below in Fig.74.

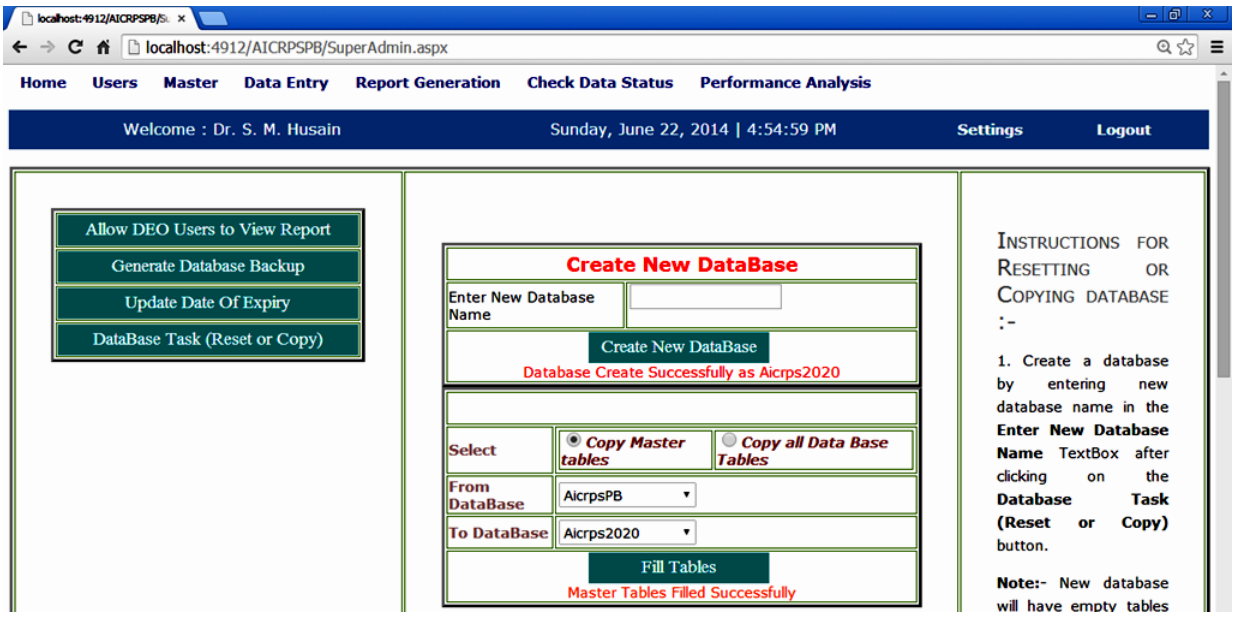


Fig.74 Reset Database Form (Fill only Master Tables)

➢ **Copy Database Utility –** This utility is used by the administrator to copy the existing database completely for security purpose, with the help of DataBase Task button in the Home page of administrator, as shown below in Fig.75.

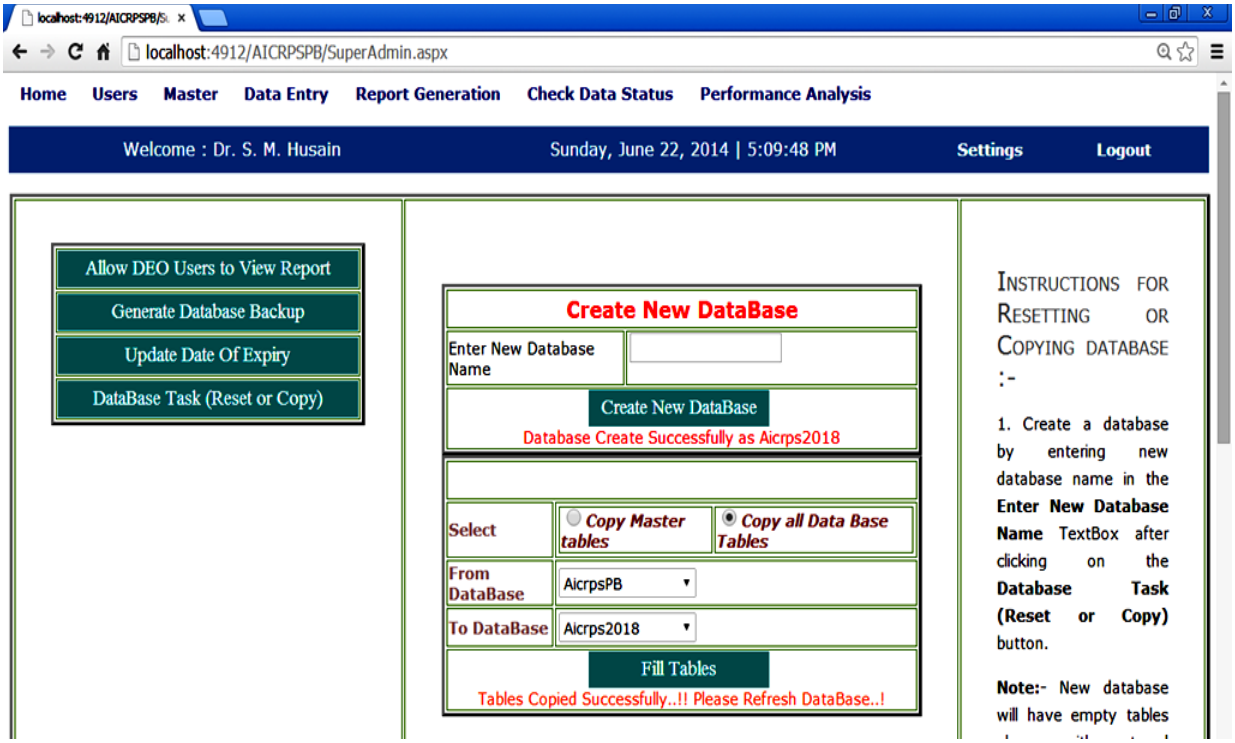


Fig.75 Copy Database Utility

➢ **Weather Data Entry Form –** This form is used by the administrator as well as DEO to enter weather data of their location with the help of Click Here For Weather Data available on data entry page, as shown below in Fig.76.

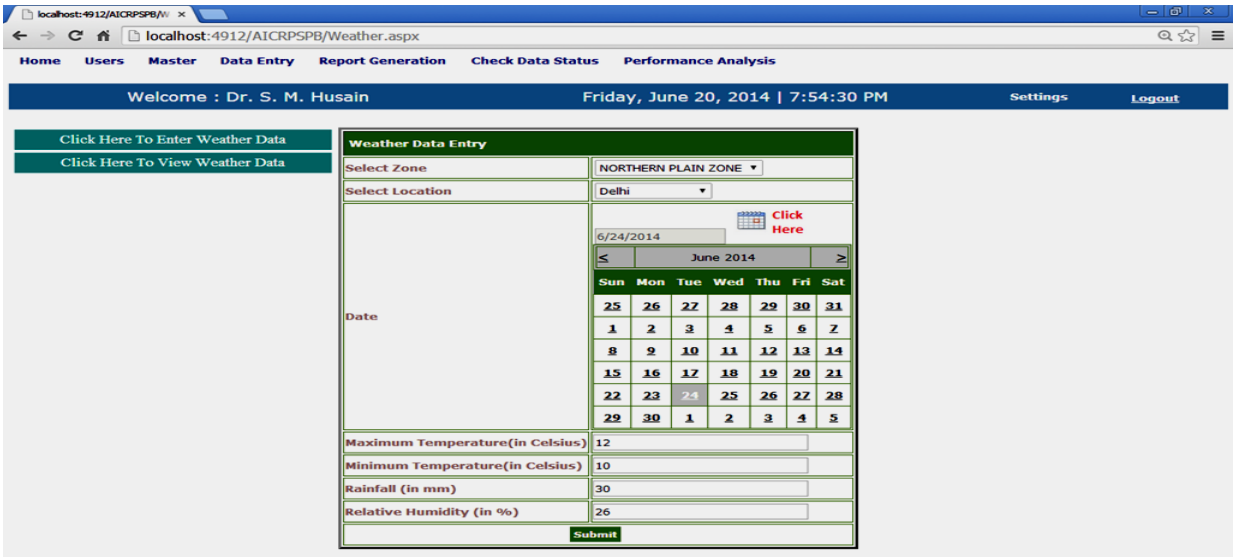


Fig.76 Weather Data Entry Form

➢ **Weather Data Viewing Form –** This form is used by the administrator as well as DEO to enter weather data of their location with the help of Click Here For Weather Data available on data entry page, as shown below in Fig.77.

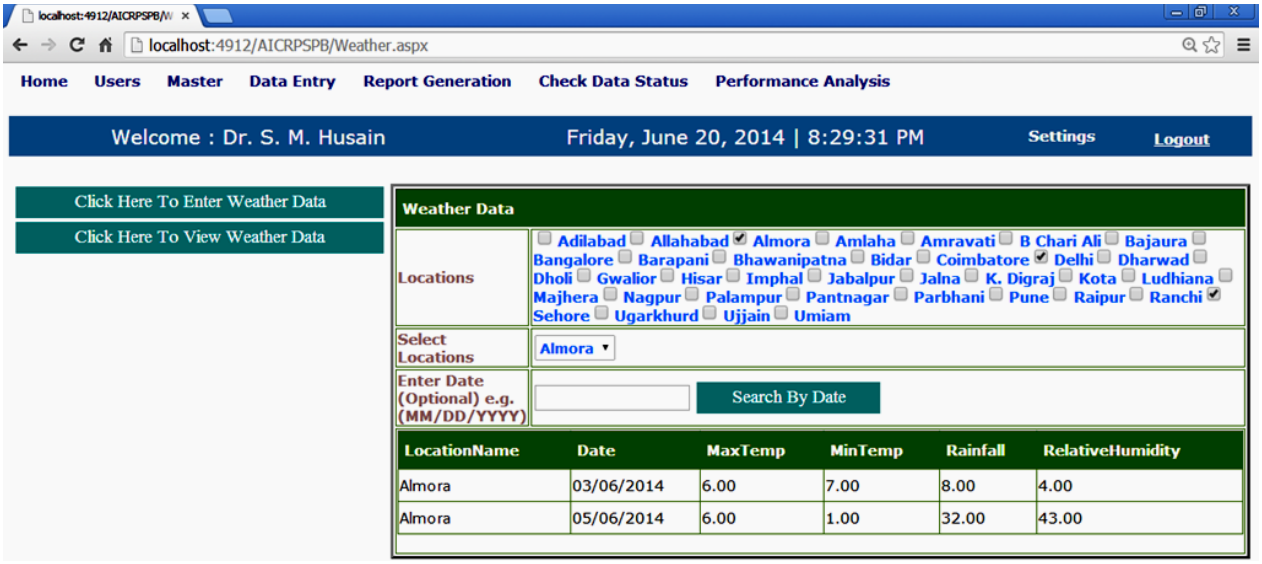
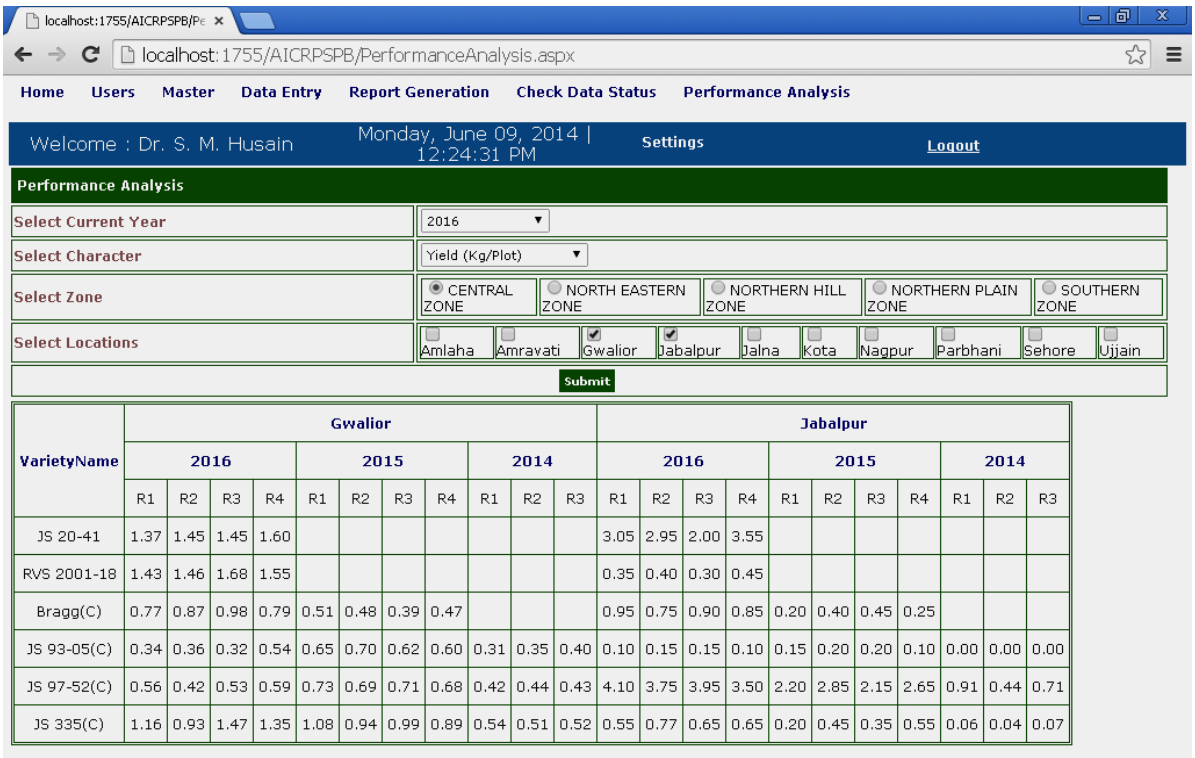


Fig.77 Weather Data Viewing Form

➢ **Performance Analysis Form –** This form is used by the administrator for performance analysis of various varieties for a particular character with the help of Performance Analysis option in the main menu, as shown below in Fig.78.



VarietyName	Gwalior											Jabalpur										
	2016				2015				2014			2016				2015				2014		
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3
JS 20-41	1.37	1.45	1.45	1.60								3.05	2.95	2.00	3.55							
RVS 2001-18	1.43	1.46	1.68	1.55								0.35	0.40	0.30	0.45							
Bragg(C)	0.77	0.87	0.98	0.79	0.51	0.48	0.39	0.47				0.95	0.75	0.90	0.85	0.20	0.40	0.45	0.25			
JS 93-05(C)	0.34	0.36	0.32	0.54	0.65	0.70	0.62	0.60	0.31	0.35	0.40	0.10	0.15	0.15	0.10	0.15	0.20	0.20	0.10	0.00	0.00	0.00
JS 97-52(C)	0.56	0.42	0.53	0.59	0.73	0.69	0.71	0.68	0.42	0.44	0.43	4.10	3.75	3.95	3.50	2.20	2.85	2.15	2.65	0.91	0.44	0.71
JS 335(C)	1.16	0.93	1.47	1.35	1.08	0.94	0.99	0.89	0.54	0.51	0.52	0.55	0.77	0.65	0.65	0.20	0.45	0.35	0.55	0.06	0.04	0.07

Fig.78 Performance Analysis Form

Chapter 7
LIMITATIONS AND CONSTRAINTS

- The software works better with "Google Chrome browser" and not with internet explorer.
- For **Performance Analysis** the format of database name should be Aicrps followed by name of the current year e.g. Aicrps2014.
- The value of 'CV' on data entry page must be less than 25% and 'Mean Yield' should be greater than 1000 kg/h (rejection criteria of data of a perticular location). In order to apply or remove this codition goto View → Solution Explorer → ReportGeneration.aspx → ReportGeneration.aspx.cs → follow the commented code in Line 434 on ReportGeneration.aspx.cs as shown below in 'Code to Apply/Remove CV and Mean Yield constraints' window-

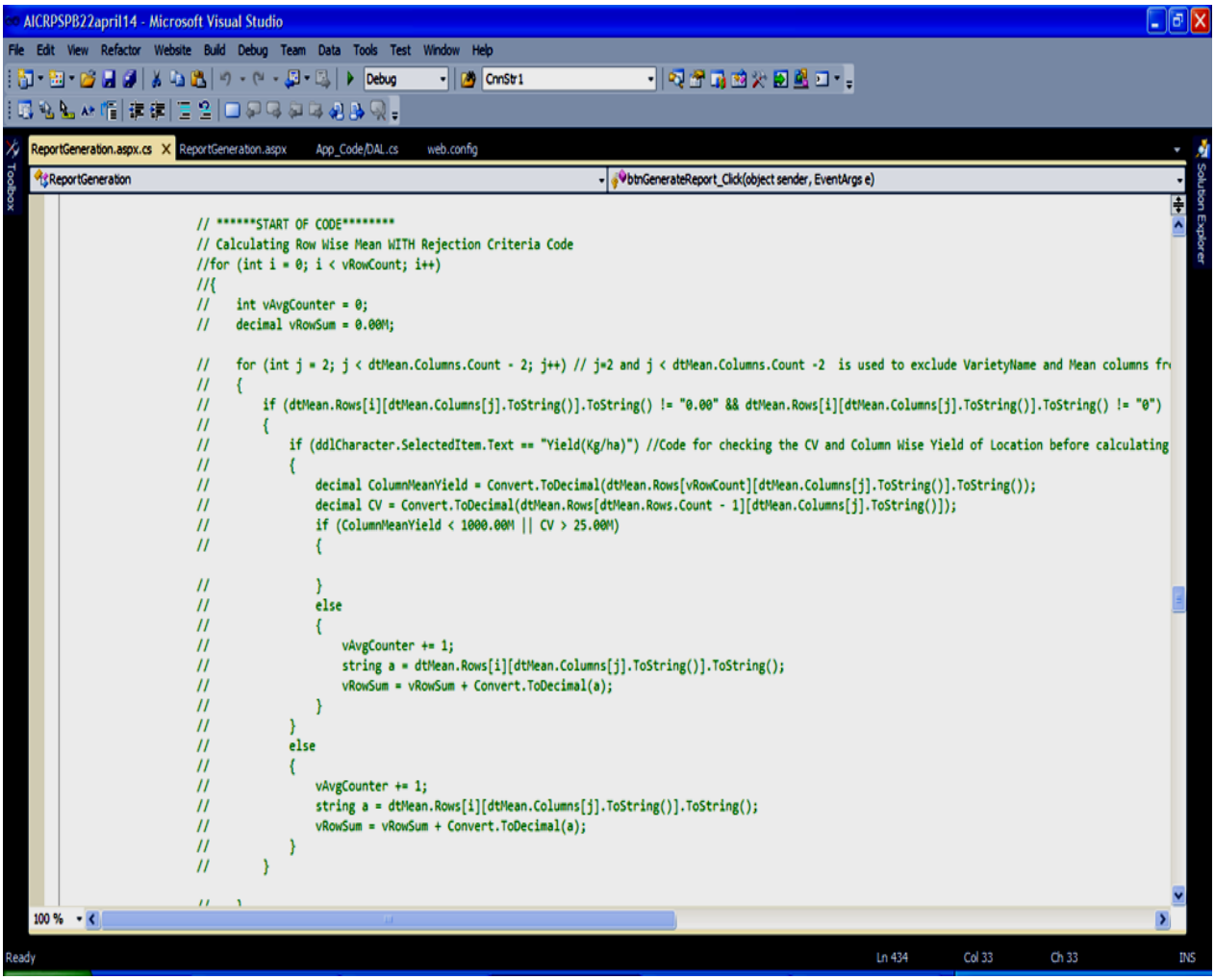


Fig.79 Code use to Apply/Remove CV and Mean Yield constraints

- The "mobile number" must be of 10 digit only.
- The present system supports only 51 roman numbers. In order to add more roman number which is to be displayed in the final report generated by the sytem, goto

View → Solution Explorer → ReportGeneration.aspx → ReportGeneration.aspx.cs → `GenerateIntoRoman` method (Line 601) → Add more cases below Line 656.

- CD and CV is shown only in case of 'Yield' character. In order to get these footer data displayed for any other character, goto View → Solution Explorer → ReportGeneration.aspx → ReportGeneration.aspx.cs →follow the commented code in Line 215 on ReportGeneration.aspx.cs as shown below in "Code to show CD and CV for other character along with 'yield' character" window -

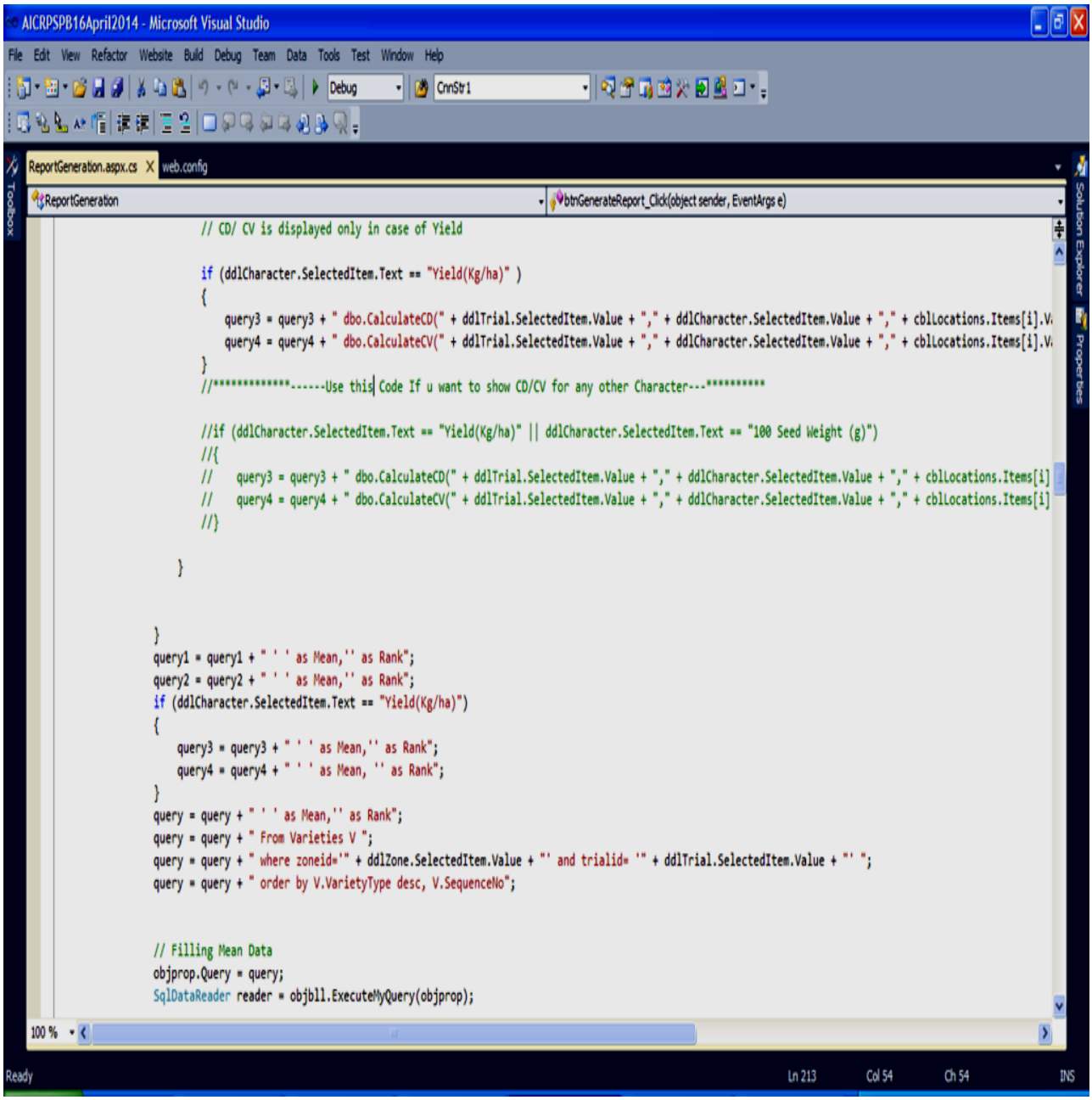


Fig.80 Code use to show CD and CV for other character along with 'yield' character

- In order to increase the Timeout period due to which an error of sever timeout comes during copying of complete database, goto View → Solution Explorer → SuperAdmin.aspx → SuperAdmin.aspx.cs → follow the code below the comment in Line 249 in Fig. 81.

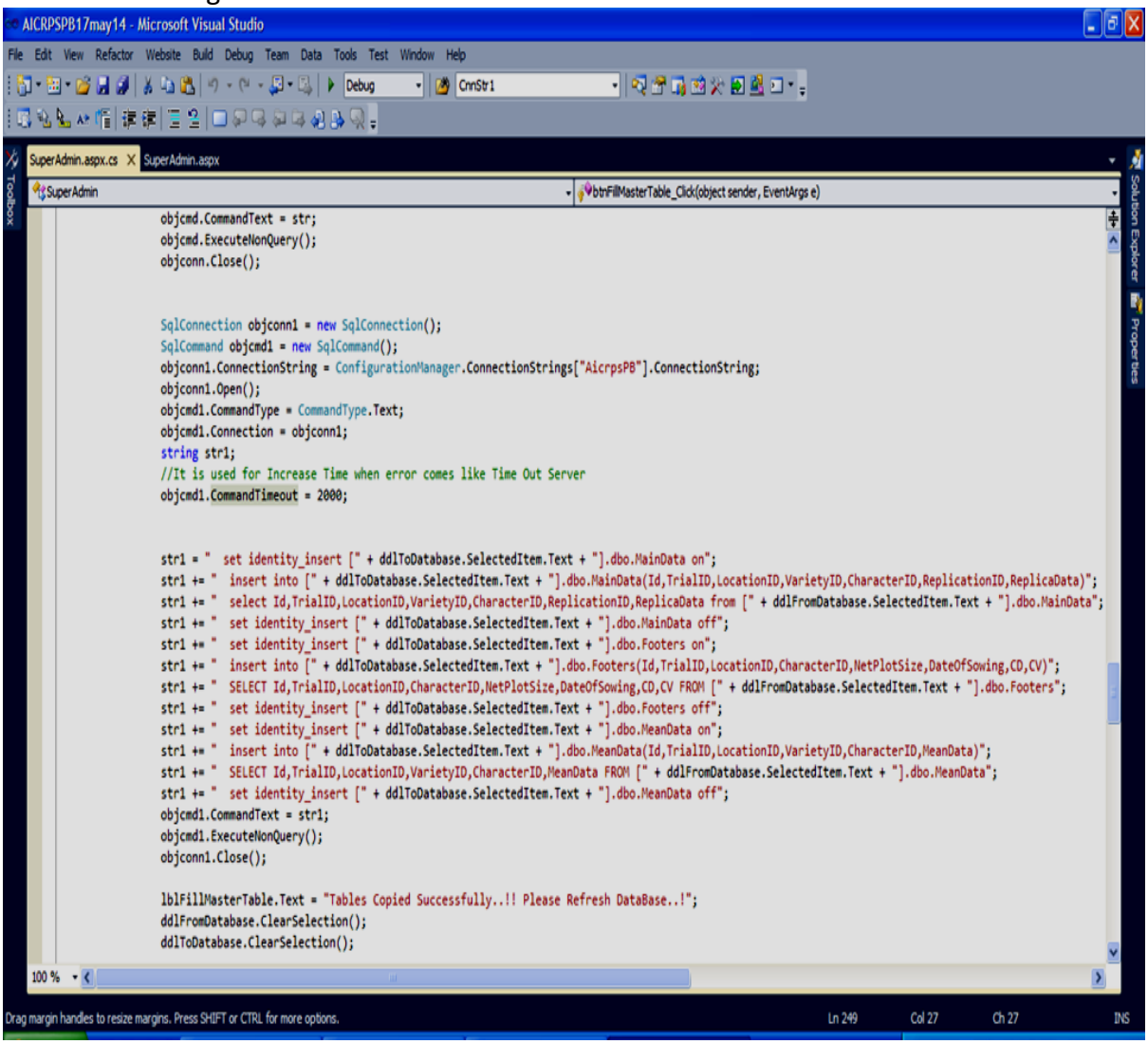


Fig.81 Code use to Increase the Time-Out period

- In order to give a person all the rights of administrator i.e to make a perticular person an administrator, goto Aicrps2013-14 database, open UserInfo table and change the entry of UserLevel column of this person to 1 which is by default 2.