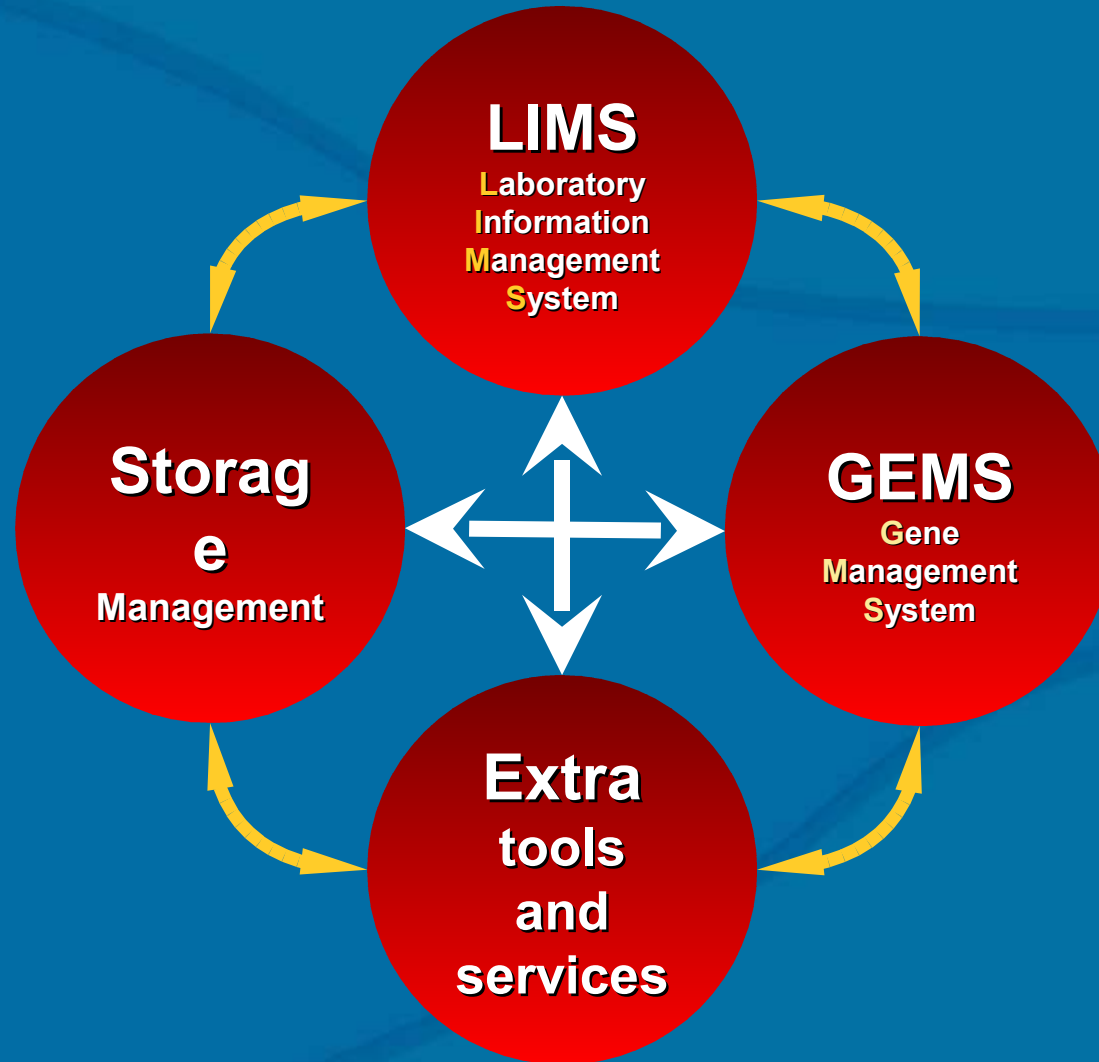


**ICIS & ICARDA LIMS / Molecular Data Integration**

**at the ICIS Workshop**

**Texcoco, Mexico - May 8<sup>th</sup> to 19<sup>th</sup>, 2006**

# ICARDA Generation LIMS & GEMS



This program consists of four main sections which offers the users and researchers an easy way to manage and exchange the information from Laboratories, Genes and Storages.

# LIMS

Laboratory  
Information  
Management  
System

Storage  
Management

GEMS  
Gene  
Management  
System

Extra  
tools and  
services

- DNA Extraction (including Extraction Protocols).
- DNA Quantification, and Gel Images.
- DNA Dilution.
- PCR Tracking, including managing information on:
  - Accessions.
  - Primers.
  - Programs.
  - Mixes.
- PCR Electrophoresis.

# LIMS

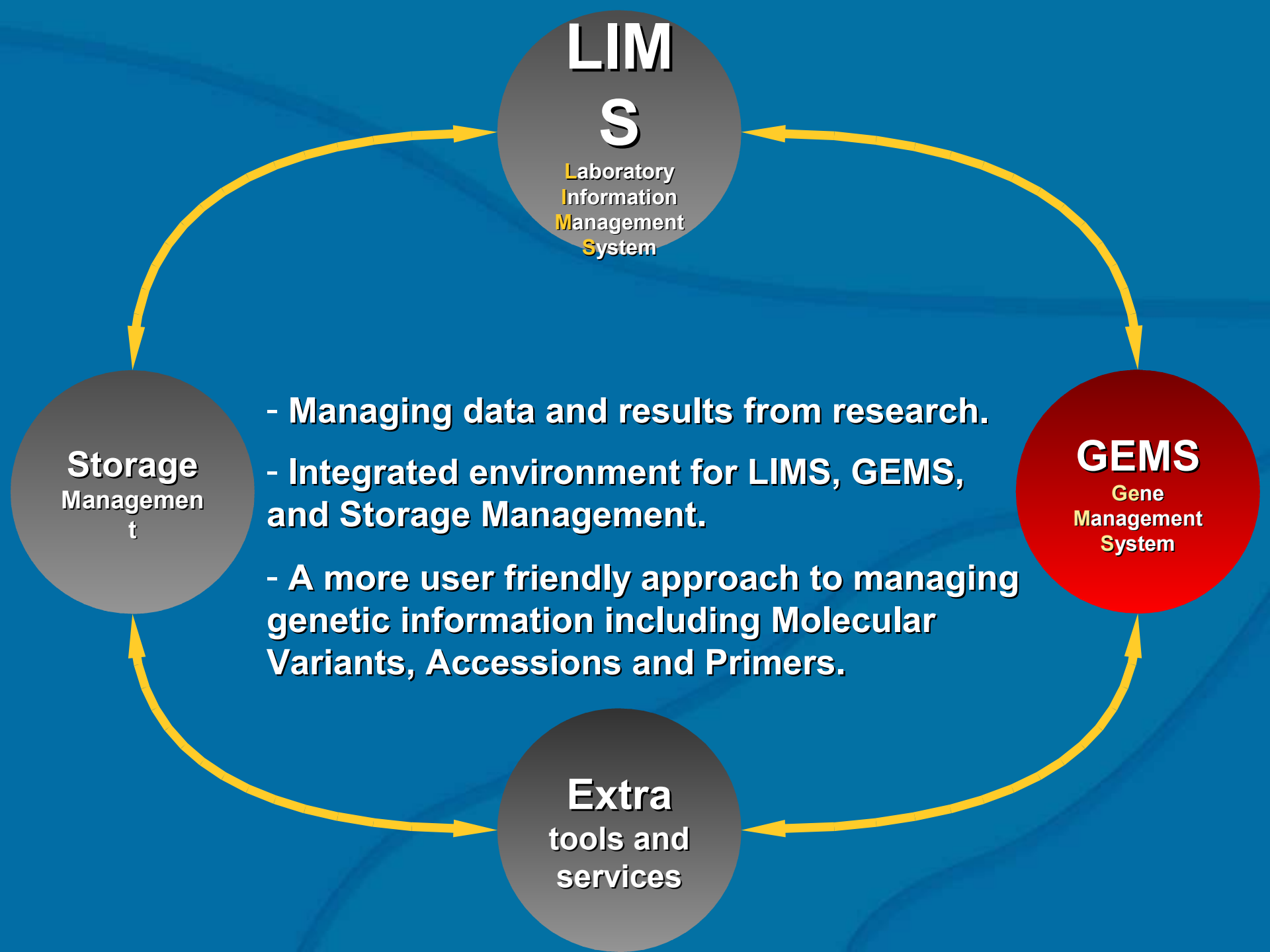
Laboratory  
Information  
Management  
System

Storage  
Management

- Managing data and results from research.
- Integrated environment for LIMS, GEMS, and Storage Management.
- A more user friendly approach to managing genetic information including Molecular Variants, Accessions and Primers.

Extra  
tools and  
services

GEMS  
Gene  
Management  
System



# LIMS

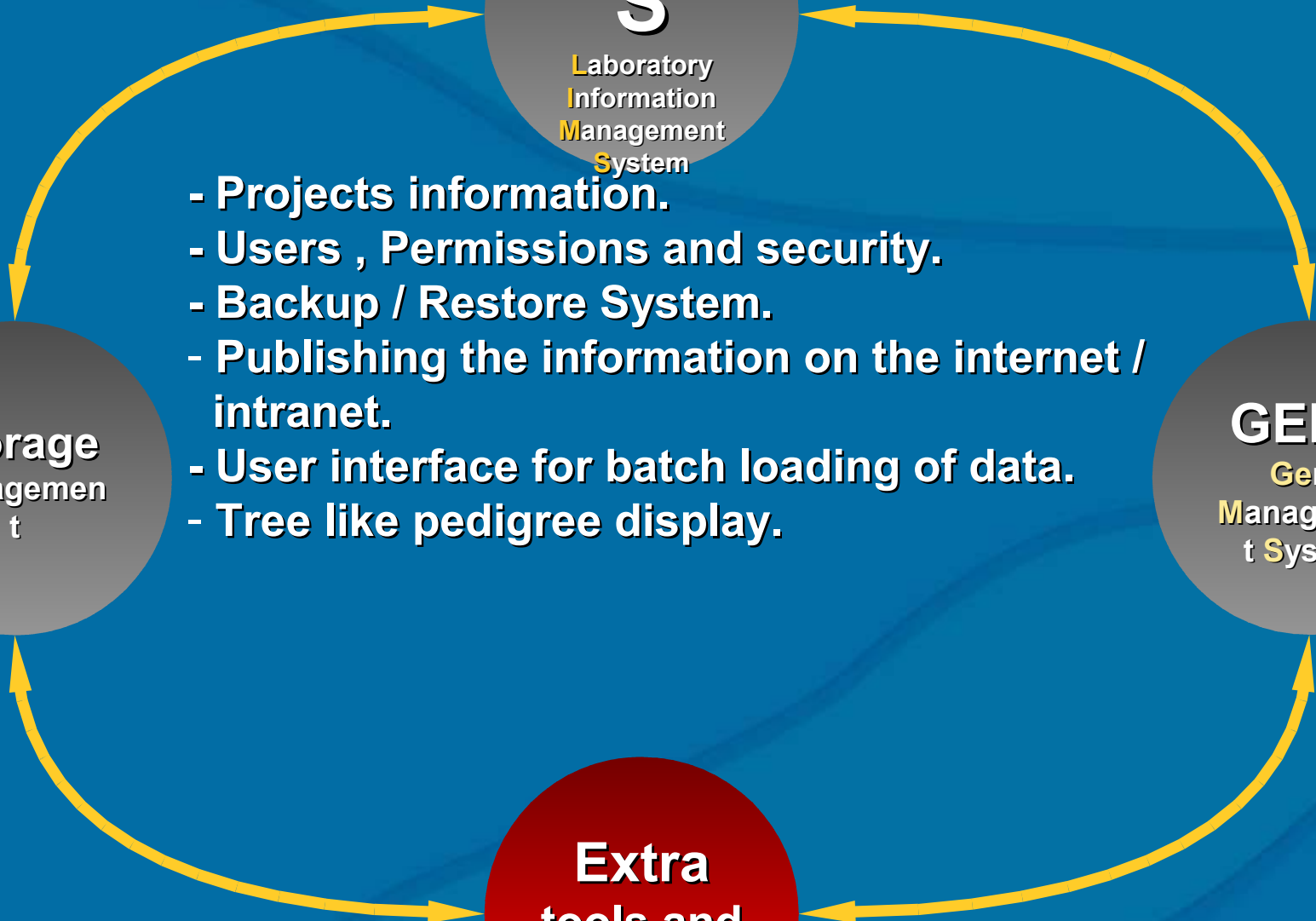
Laboratory  
Information  
Management  
System

- Projects information.
- Users , Permissions and security.
- Backup / Restore System.
- Publishing the information on the internet / intranet.
- User interface for batch loading of data.
- Tree like pedigree display.

Storage  
Management

GEMS  
Gene  
Management  
System

Extra  
tools and  
services



**LIM**

**S**

Laboratory  
Information  
Management  
System

This section is concerned with managing the information on materials used in the laboratories (Stocks). And it includes:

- Materials used in the day to day work in the laboratories such as chemicals, accessories... .).
- Accessions.
- DNA
- Diluted DNA
- Master Mixes

**Storage  
Management**

**GEMS**  
Gene  
Management  
System

**Extra  
tools and  
services**

**LIM**

**S**

Laboratory  
Information  
Management  
System

**The Storage Management Systems handles:**

- min and max quantities of materials.
- Auto requesting system of materials.
- expiring dates .
- storage places in the stores and fridges .
- Follow up the situation of the growing plants.

**Storage  
Management**

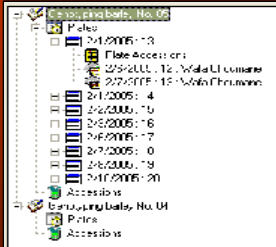
**GEMS**  
Gene  
Management  
System

**Extra  
tools and  
services**





## My Work Space



The screenshot displays the 'My Work Space' application interface. At the top, there are input fields for project information:

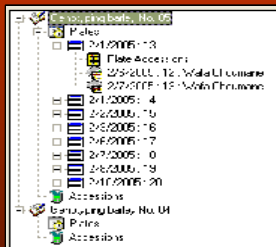
- Project Name: Genotyping barley No. 05
- Project Type: Experiment
- Investigator: Wafa Choumane
- Start Date: 1/1/2005
- End Date: (empty)

The main area shows a hierarchical tree view of the project data:

- Genotyping barley No. 05
  - Plates
    - 2/1/2005 : 13
      - Plate Accessions
        - 2/6/2005 : 12 : Wafa Choumane
        - 2/7/2005 : 13 : Wafa Choumane
    - 2/1/2005 : 14
    - 2/2/2005 : 15
    - 2/3/2005 : 16
    - 2/6/2005 : 17
    - 2/7/2005 : 18
    - 2/8/2005 : 19
    - 2/10/2005 : 20
  - Accessions
- Genotyping barley No. 04
  - Plates
  - Accessions

An easy way that helps the user to reach the information in a short time, and to control the information starting from DNA Extraction, Gel Images and DNA Dilution.

## My Work Space



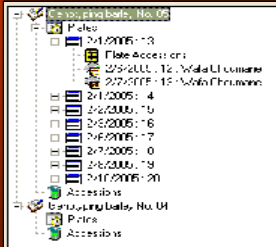
## Project details, etc

The screenshot shows the 'My Work Space' application window. On the left is a tree view with 'Genotyping barley No. 05' selected. The main area on the right contains a form for project details:

Project Name	Project Type	Investigator
Genotyping barley No. 05	Experiment	Wafa Choumane
Start Date	End Date	
1/1/2005		
Objective		
Remarks		

The 'Objective' and 'Remarks' fields are large text areas with scrollbars. The 'Remarks' field has a yellow background. The 'Accessions' folder in the tree view is highlighted with a green icon.

## My Work Space



## Plates information relating to projects

My Work Space...

Genotyping barley No. 05

- Plates
  - 2/1/2005 : 13
  - Plate Accessions
    - 2/6/2005 : 12 : Wafa Choumane
    - 2/7/2005 : 13 : Wafa Choumane
  - 2/1/2005 : 14
  - 2/2/2005 : 15
  - 2/3/2005 : 16
  - 2/6/2005 : 17
  - 2/7/2005 : 18
  - 2/8/2005 : 19
  - 2/10/2005 : 20
- Accessions

Genotyping barley No. 04

- Plates
- Accessions

Run Date	Project Name	Type of Material	Age of Material	Extraction Protocol
2/1/2005	Genotyping barley	Leaves	14	Wafa Choumane
2/1/2005	Genotyping barley	Stems	14	Wafa Choumane
2/2/2005	Genotyping barley	Leaves	21	Wafa Choumane
2/3/2005	Genotyping barley	Leaves	21	Wafa Choumane
2/6/2005	Genotyping barley	Seeds	7	Wafa Choumane
2/7/2005	Genotyping barley	Leaves	14	Wafa Choumane
2/8/2005	Genotyping barley	Leaves	14	Wafa Choumane
2/10/2005	Genotyping barley	Leaves	14	Wafa Choumane

New DNA Extraction - Plate information

Extraction ID:  Run Date:  Project Name:  Done By:

Type of Materials:  Age of Material:  Protocol Name:

Remarks

Accession	Code	Optical density (260)	Optical density (280)	Dilution Factor	Estimated DNA Concentration (mg/ml)	Ratio
Acc.1		0.02	0.01	200	0.2000	2.0000
Acc.2		0.10	0.05	200	1.0000	2.0000
Acc.3		0.09	0.06	200	0.9000	1.5000
Acc.4		0.05	0.02	200	0.5000	2.5000
Acc.5		0.07	0.05	200	0.7000	1.4000
Acc.6		0.06	0.03	200	0.6000	2.0000
Acc.7		0.03	0.02	200	0.3000	1.5000
Acc.8		0.05	0.02	200	0.5000	2.5000
Acc.9		0.04	0.02	200	0.4000	2.0000
Acc.10		0.07	0.03	200	0.7000	2.3333

## Batch Loading



**Molecular Variants**

Primer	Accession Code	Accession GID	MV Type	Molecular Weight	MW Tolerance	Allele No.
Scssr09398	1	190120	Allele	162		2
Scssr09398	161	189787	Allele	161		2
Scssr09398	161	189787	Allele	321		22
Scssr09398	162	189786	Allele	169		5
Scssr09398	163	189785	Allele	190		16
Scssr09398	164	189784	Allele	160		2
Scssr09398	165	189783	Allele	331		25
Scssr09398	165	189783	Allele	187		15
Scssr09398	165	189783	Allele	174		6
Scssr09398	165	189783	Allele	139		1
Scssr09398	165	189783	Allele	185		13
Scssr09398	165	189783	Allele	139		1
Scssr09398	165	189783	Allele	163		2
Scssr09398	165	189783	Allele	172		6

**Microsoft Excel - Set11-Bmag382-wafa-ch...**

	A	B	C
68	67	67*343	Bmag0382
69	68	68*66	Bmag0382
70	69	69*342	Bmag0382
71	70	70*67	Bmag0382
72	71	71*341	Bmag0382
73	72	72*330	Bmag0382
74	73	73*329	Bmag0382
75	74	74*328	Bmag0382
76	75	75*327	Bmag0382
77	76	76*326	Bmag0382
78	77	77*325	Bmag0382

**Batch Loading**

1- Select machine name:  
ABI Sequencer 377

2- Select data file:  
C:\Documents and Settings\Hsimo\Desktop\micrisatalites

3- Loading:  
0%

Start Loading Close

The batch input program saves time and secures high accuracy for the data entry by importing the information directly from the sequencer.

## Search: GEMS



### Search: GEMS Information

Project Name: Genotyping barley Nc  PCR ID:             
 Run Date: From            To             
 Detect Machine: ABI-PRISM, 377-DNA Seq.  
 PCR Program Name: PCR-1

Molecular Variants Type: Allele  
 Molecular Weight From            To           

Primer : WH221  Primer Type: SSR  
 Chromosomal location:  
 Primer Sequence F: ACGCATGAACCGT  
 Primer Sequence R:             
 Anneal Temp: From            To             
 Expected Size: From            To           

Accession Code: 1  Accession (GID): 190120



Search



Close



Search Conditions



Search Results



Export

An advance search window that allows user to choose different search criteria.

## Search: GEMS



User can get more details on displayed records and edit related information based on the side buttons

Search: GEMS Information

Accession Code	GID	Primer	MV Type	Molecular Weight	PCR Machine	PCR Program	Run Date	Project
1	190120	Scssr09398	Allele	162	ABI-PRISM, 377-DNA Seq.	PCR-7	9/20/2004	otyping barley N
161	189787	Scssr09398	Allele	161	ABI-PRISM, 377-DNA Seq.	PCR-7	9/20/2004	otyping barley N
161	189787	Scssr09398	Allele	321	ABI-PRISM, 377-DNA Seq.	PCR-7	9/20/2004	otyping barley N
162	189786	Scssr09398	Allele	325	ABI-PRISM, 377-DNA Seq.	PCR-7	9/20/2004	otyping barley N
163	189785	Scssr09398	Allele	169	ABI-PRISM, 377-DNA Seq.	PCR-7	9/20/2004	otyping barley N
164	189784	Scssr09398	Allele	190	ABI-PRISM, 377-DNA Seq.	PCR-7	9/20/2004	otyping barley N
165	189783	Scssr09398	Allele	160	ABI-PRISM, 377-DNA Seq.	PCR-7	9/20/2004	otyping barley N
165	189783	Scssr09398	Allele	331	ABI-PRISM, 377-DNA Seq.	PCR-7	9/20/2004	otyping barley N
166	189782	Scssr09398	Allele	187	ABI-PRISM, 377-DNA Seq.	PCR-7	9/20/2004	otyping barley N
167	189781	Scssr09398	Allele	174	ABI-PRISM, 377-DNA Seq.	PCR-7	9/20/2004	otyping barley N
168	189780	Scssr09398	Allele	139	ABI-PRISM, 377-DNA Seq.	PCR-7	9/20/2004	otyping barley N

Search Conditions   Search Results   Export

- PCR Information
- Programs Information
- Mix Information
- Primer Information



# ICARDA Gene Management System ...

ICARDA activities under the Generation Challenge Programme

ICARDA activities under the GIP

PCR Search

PCR Mix

PCR Program

PCR Tracking

PCR ID	Project Name	Run Date	Machine	PCR Program	PCR MIX	Done By
1	Dr. Wahe Zaka	05/02/06	Gene 1	Gene 1	FL55	Gene 1
2	Dr. Wahe Zaka	06/02/06	Gene 1	Gene 1	FL55	Gene 1
3	Dr. Wahe Zaka	06/02/06	Gene 1	Gene 1	FL55	Gene 1
4	Dr. Wahe Zaka	06/02/06	Gene 1	Gene 1	FL55	Gene 1
5	Dr. Wahe Zaka	06/02/06	Gene 1	Gene 1	FL55	Gene 1
6	Dr. Wahe Zaka	06/02/06	Gene 1	Gene 1	FL55	Gene 1
7	Dr. Wahe Zaka	06/02/06	Gene 1	Gene 1	FL55	Gene 1
8	Dr. Wahe Zaka	06/02/06	Gene 1	Gene 1	FL55	Gene 1
9	Dr. Wahe Zaka	06/02/06	Gene 1	Gene 1	FL55	Gene 1
10	Dr. Wahe Zaka	06/02/06	Gene 1	Gene 1	FL55	Gene 1

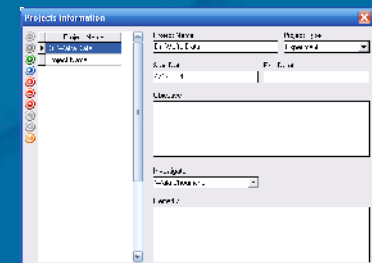
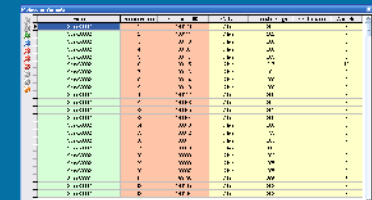
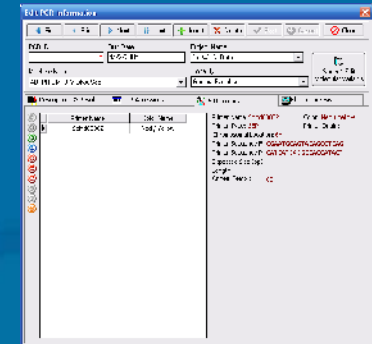
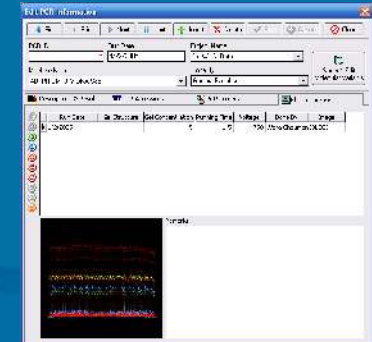
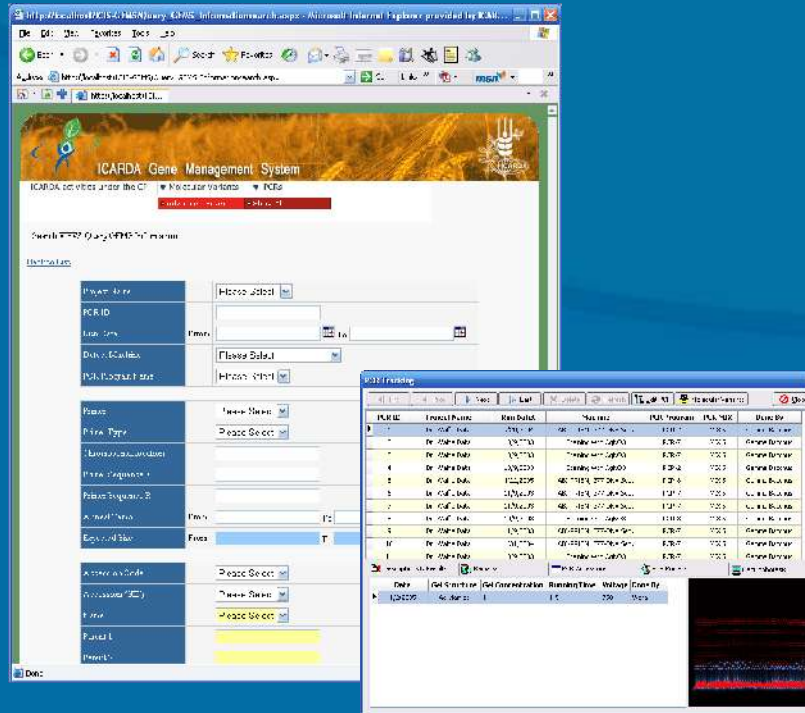
- the convenient starting point for managing the information on Genes.

- Integrated with ICIS GMS database.

- client / server web application; The users can access to the **ICARDA Gene Management System** without any special programs, they only need internet browser (and the users can use any operating system in client's side of web application).



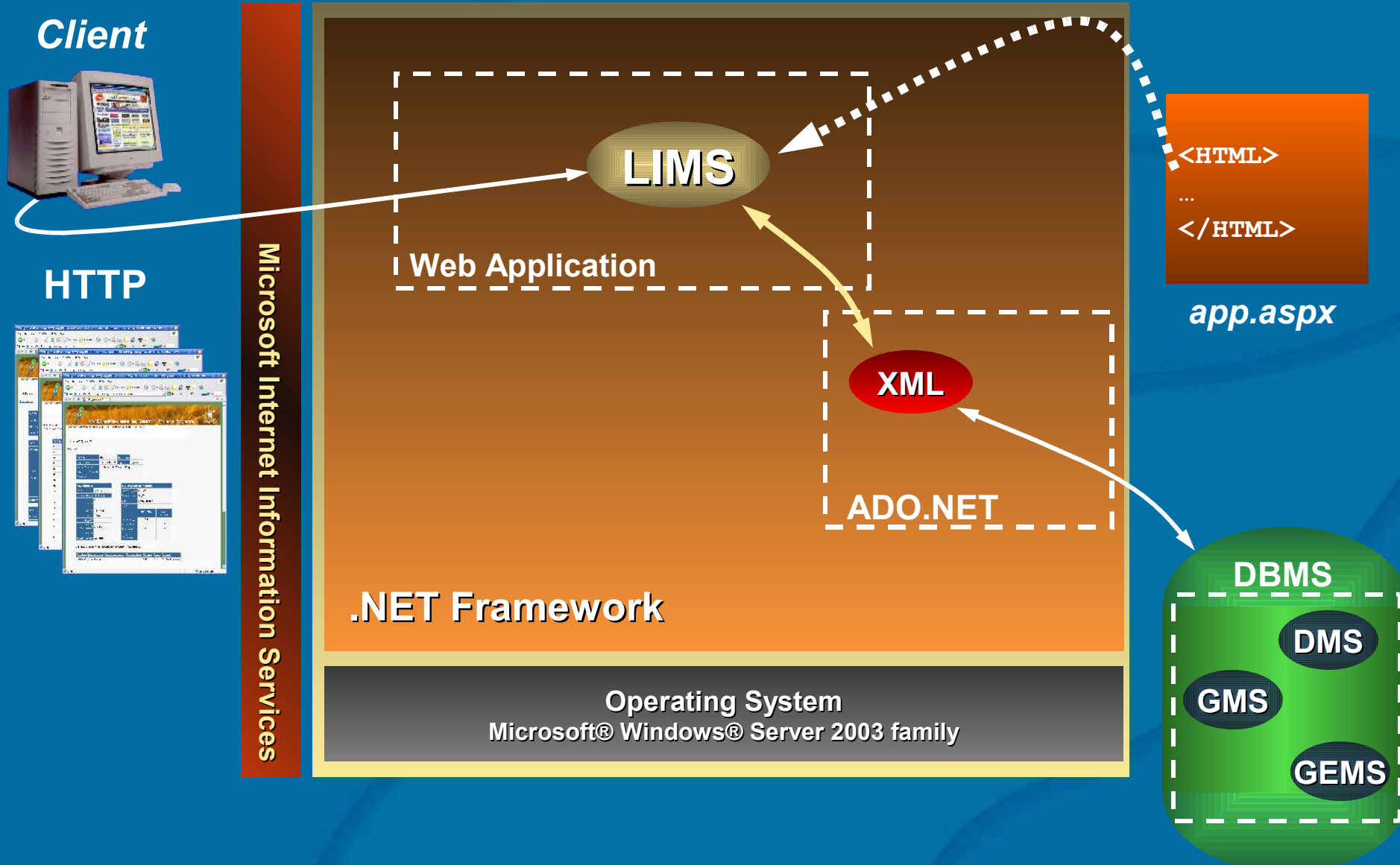
# ICARDA Gene Management System ...



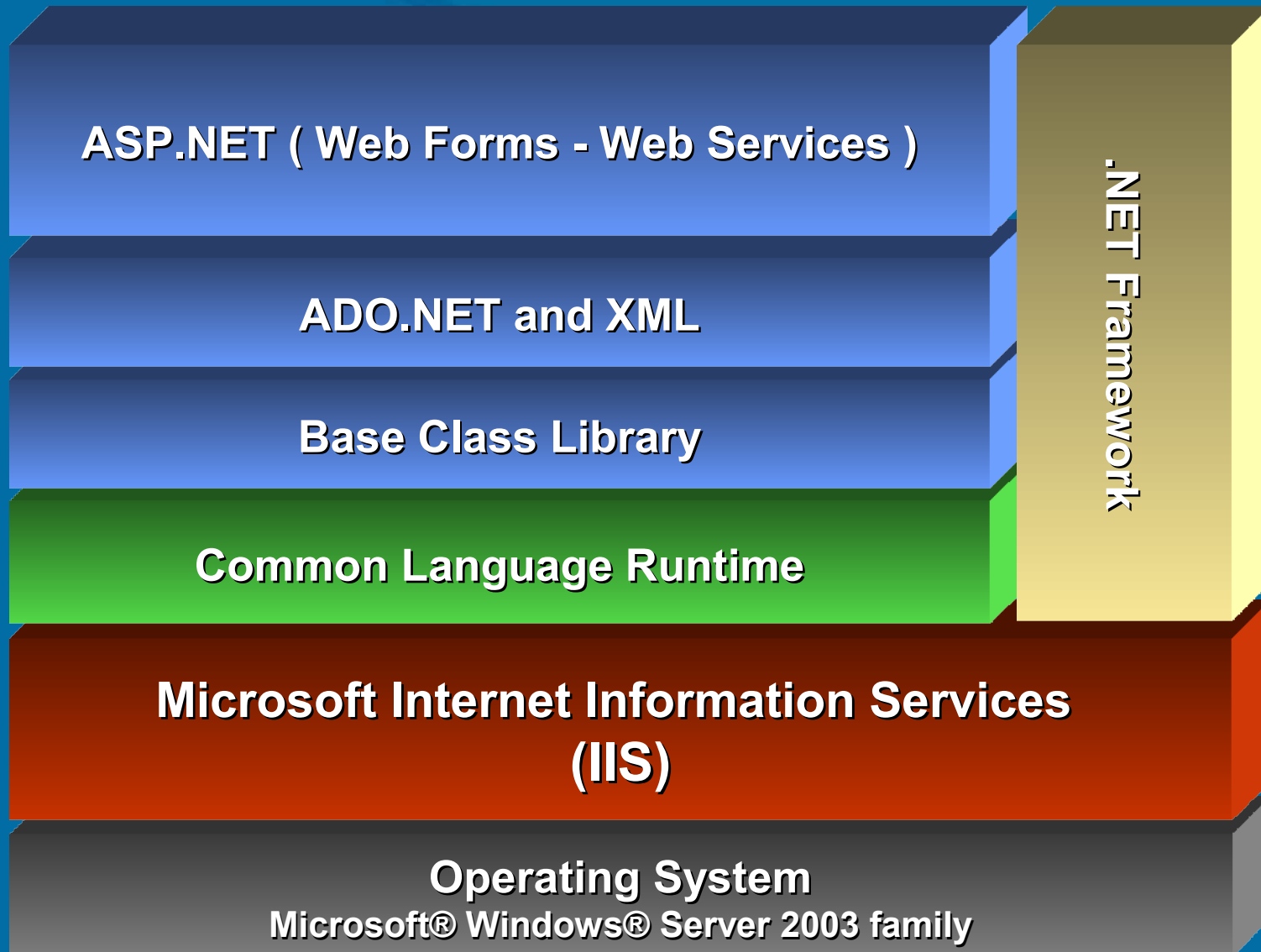
- users can specify several search criteria:

- Accession name (GID)
- Molecular Variant (MV)
- Type of MV
- Weight of MV (and range of MV Weight).
- Type of Polymorphism Detector (PD)
- Primer (s) used
- PCR Conditions
- Detection Machine and Color
- Project information

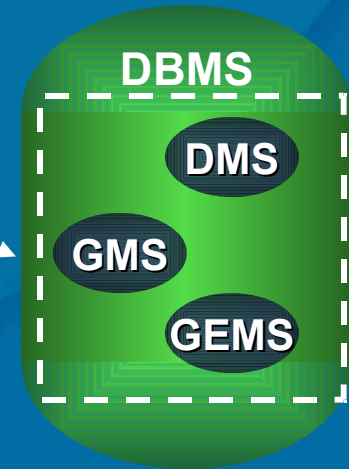
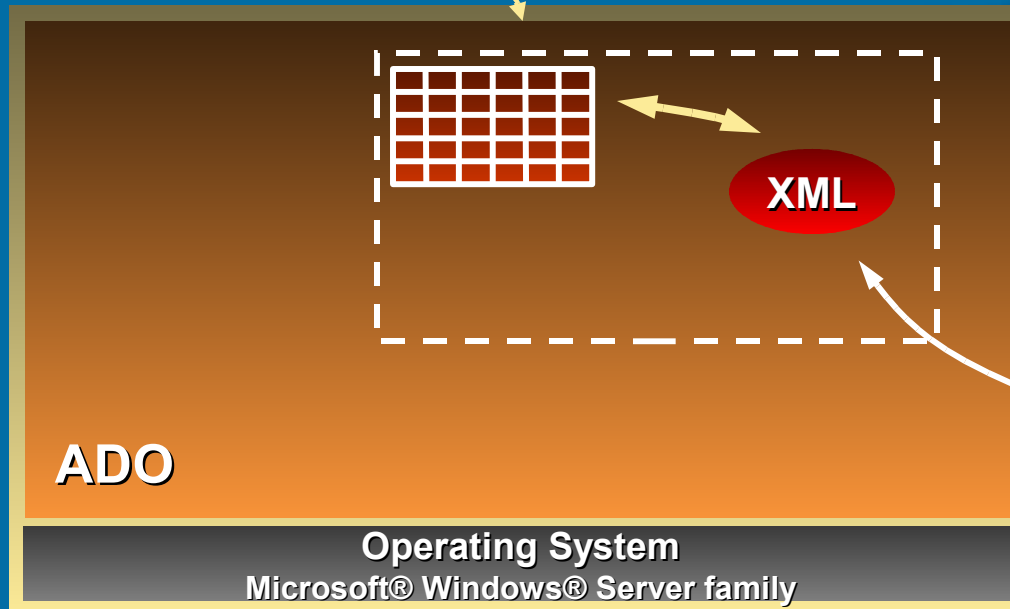
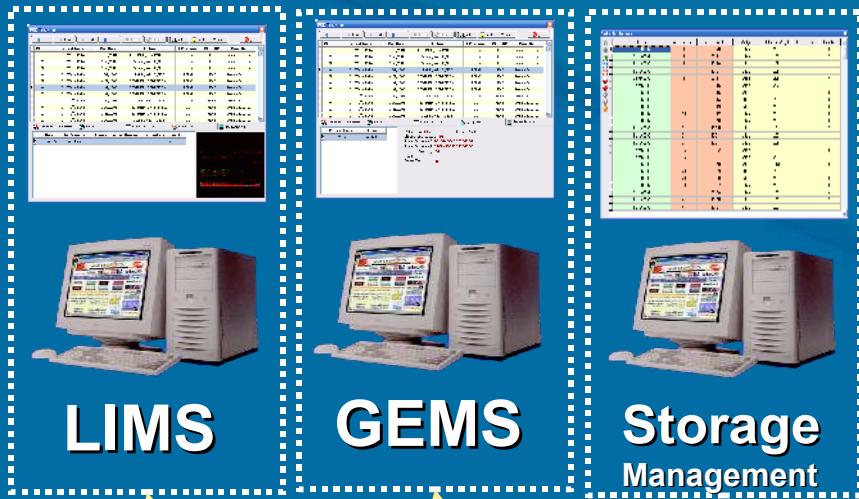
# How ICARDA Generation GEMS Web Base Application works !!!



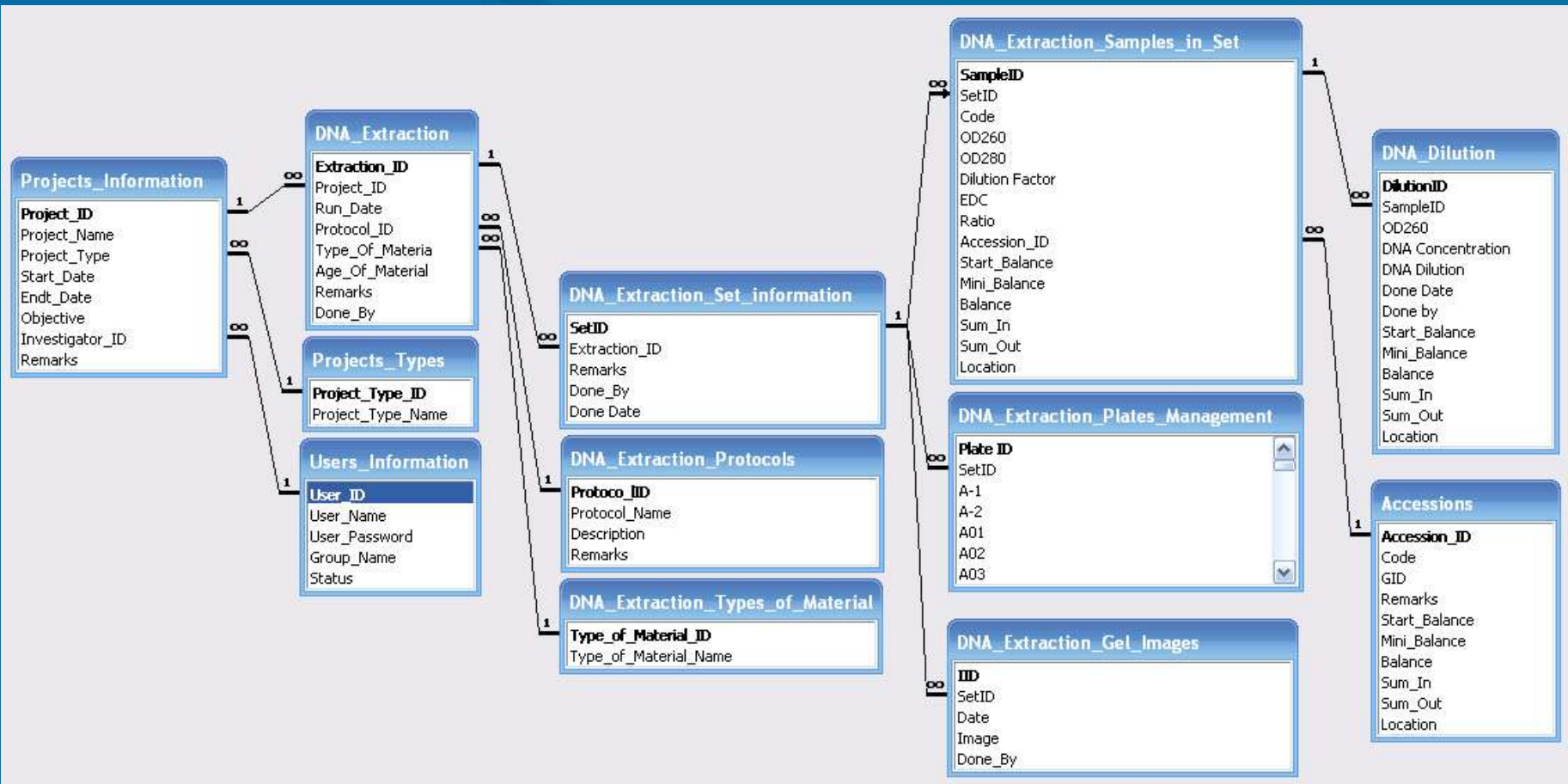
# Server side applications



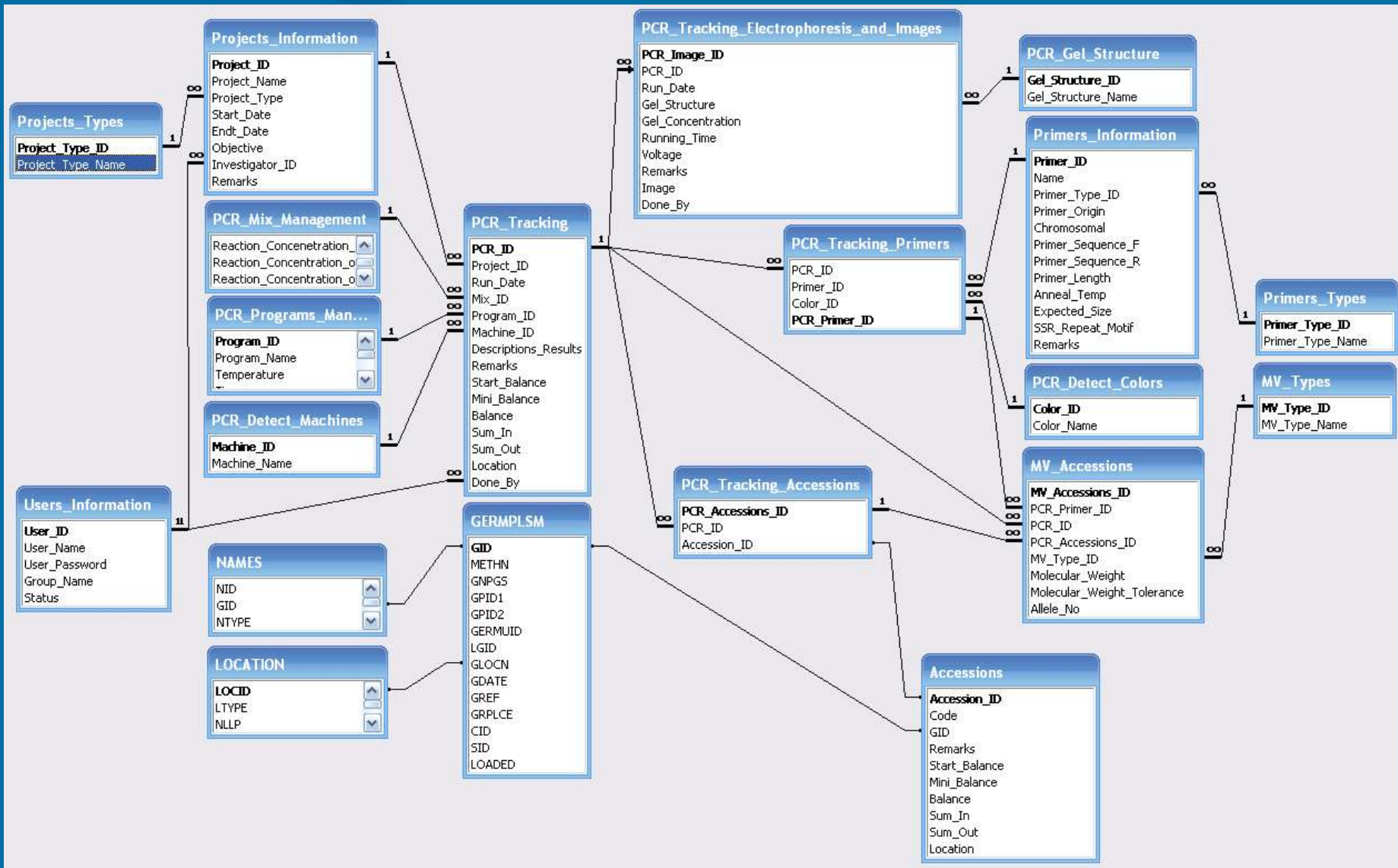
# ICARDA Gene Management System ...



# The Relations between LIMS tables

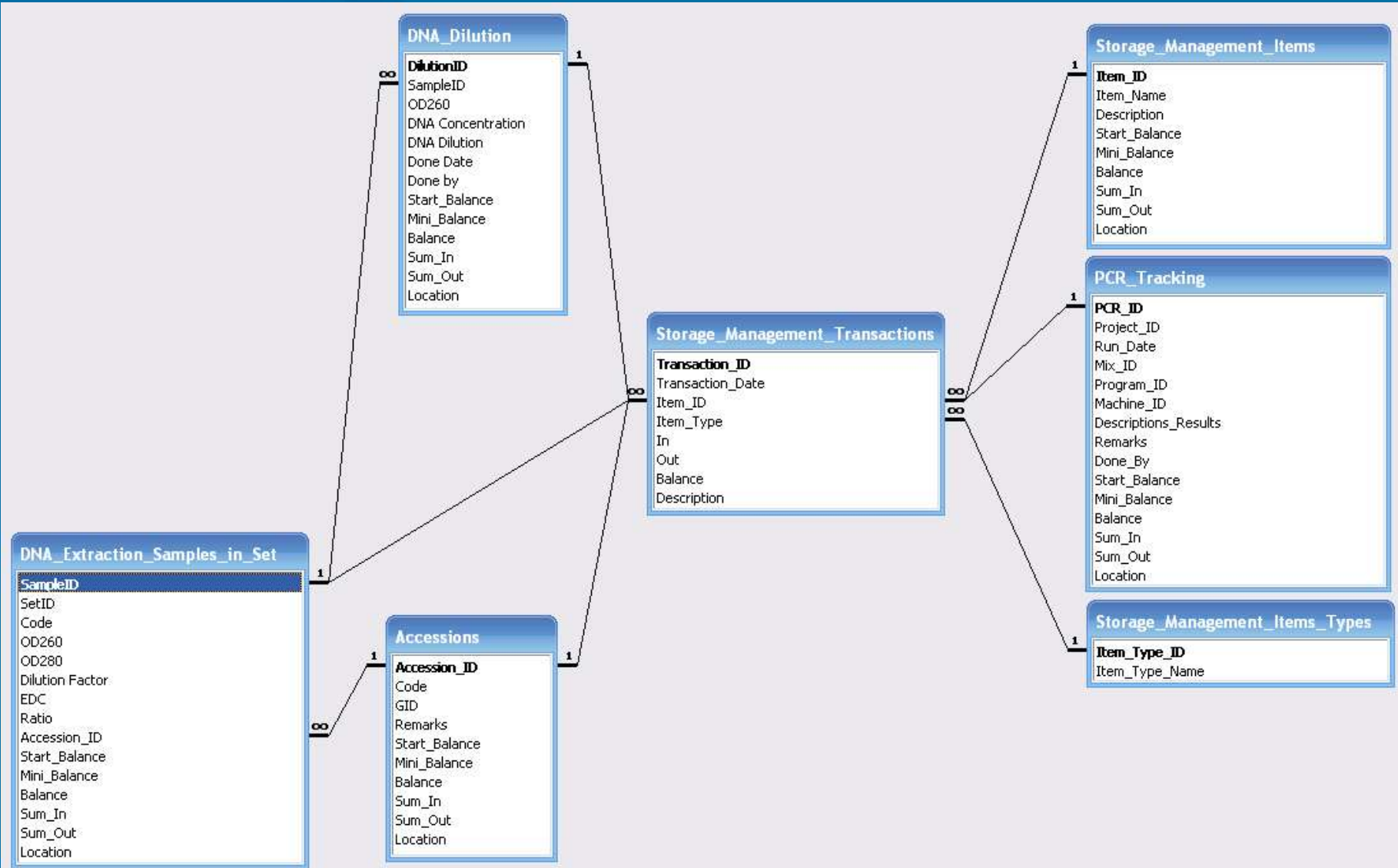


# The Relations between GEMS tables





# The Relations between the tables in storage management



# The Security System specification ...

There are three levels of security access in LIMS & GEMS described below:

**Administrators:** The user who has this account is responsible for managing the data (Add/ Modify/ Delete). This account has all permissions on the system.

**Users:** All users can browse and search data. Users can only modify their own data but not the data entered by someone else.

**Guests:** This account is read only, that means user with guest privileges can be able to browse and search only.





The source codes on LIMS & GEMS are deposited at  
this site.

<ftp://ftp.cgiar.org/icarda/LIMS-GEMS>



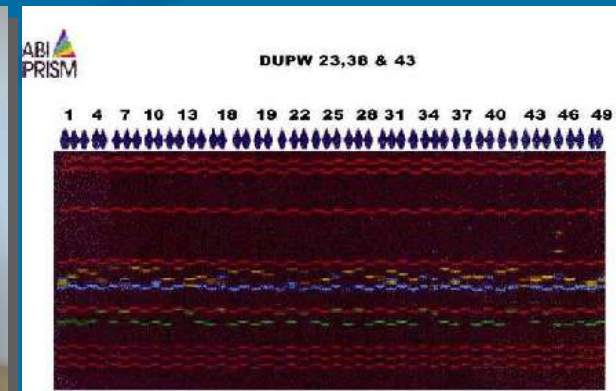
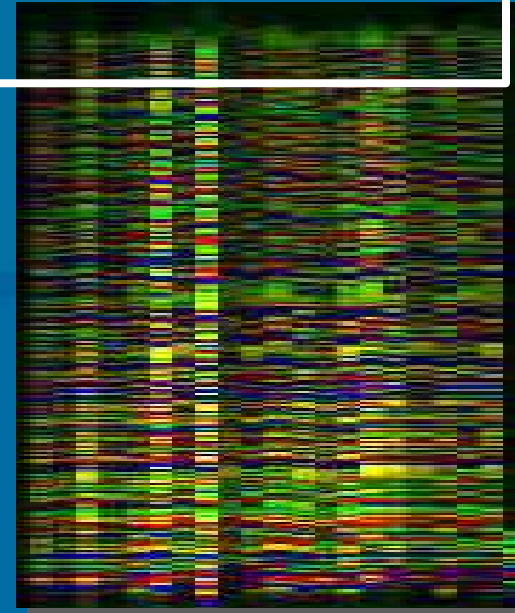
## to do list...

- **Will present the MV information of different plants and primers in a 3D image, which helps the researchers to visualize their results .**
- **Comprehensive user manual**
- **A set of visualization tools are being planned for the different aspects of the GEMS**
- **Java programmer will start first week in June to make a start on java equivalent**

# SP1: Genetic Diversity of Global Genetic Resources

## Germplasm characterisation

- Genotyping 3000 accessions of barley with CAAS (50 SSRs)
- Genotyping 3000 accessions of wheat with CIMMYT (50 SSRs)
- Genotyping 3000 accessions of chickpea with ICRISAT (50 SSRs)
- Genotyping 1000 accessions of lentils (20 SSRs)



*Thanks for listening*