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## ***Building the CIARD Framework for Data and Information sharing—Moroccan case***

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### **Moroccan Situation**

Agriculture sector has a substantial role in the macroeconomic balance of the country. It plays an important social role as 80% of the 14 millions rural populations depend on revenues from the agricultural sector. Agriculture contributes by 19% of the GNP, with 15% from agriculture and 4% from agro-industry. For these reasons, scientific and technical information in general and agricultural information in particular were a major concern for Moroccan government since early 70's. An institutional body called the National Documentation Centre [www.cnd.hcp.ma](http://www.cnd.hcp.ma) was mandated by law to collect, process and manage information (conventional and non conventional) using information technology. CND offered online access to scientific and technical information resources through European information providers (questel/orbit [www.orbit.com](http://www.orbit.com) and Ovid [www.ovid.com](http://www.ovid.com)). In early 90's, a national agricultural information system was set as basis for information sharing between NARS institutions. In early 2000, a Moroccan institute for Scientific and technical information IMIST [www.imist.ma](http://www.imist.ma) was founded under the supervision of the National research council [www.cnr.ma](http://www.cnr.ma). IMIST is serving the Moroccan research community among universities and research centres via the government-driven 'Maroc Wide Area Network' (MARWAN) [www.marwan.ac.ma](http://www.marwan.ac.ma). IMIST is hosting national databases on thesis and researchers besides offering access to a wide range of online resources of scientific and technical literature through a portal the Maghreb Virtual Science Library [www.mvslmorocco.ma](http://www.mvslmorocco.ma). In 2008, the Government launches the Moroccan Green plan 2010-2010 with 10 billions dollars budget. This plan is based on projects and actions plans for each region. In accordance to this plan, the Ministry of agriculture is taking a series of actions related to NARS restructuring and extension that will impact information resources access and sharing among stakeholders.

Exchange of research information/ data is done through different communication channels. At individual level, the large use of internet services (mail and group discussions) made communication between the research communities easier, to prepare joint papers, presentations or posters for conferences, workshops and agricultural fairs. Some researchers are using the European Website CORDIS <http://cordis.europa.eu/> to interact with their European partners. In addition, some researchers are maintaining their own websites where research information is published. At institutional level, exchange of information is done through information systems of national and international levels. Most agricultural institutions have their own websites. Some are providing access to information resources (references publications with full text access to journal papers, GIS based system on soil fertility and land suitability, genetic resources and more recently genome data). This shows that successful systems are those which are backed by decision makers, based on voluntary contribution of national institutions, provided with incentives to stakeholders (capacity building, logistics with sets of tools and standards) and support for projects maintenance. On the other hand, information systems with limited resources and no incentives have

little chance to sustain. Some examples of major constraints are related to lack of existing strategy for coordinating information content generation and use, lack of awareness of decision makers, lack of funding for supporting projects maintenance and viability, and lack of standards use making it difficult data exchange and sharing,

Though the concept of interoperability can not be considered in the Moroccan situation since we are far from adopting new trends in interoperability, however, some examples showed that existing information resources was used to feed information systems on soil fertility and genetic resources in Morocco. In the first example, data on land suitability maps were integrated to the soil fertility information system. This information system was also enriched with existing data on water resources, climate forecast and desertification. In the second example, data from an existing database of Moroccan species gene bank was used to feed Moroccan data on the Global Plan of Action (GPA) on Plant Genetic Resources for Food and Agriculture (PGRFA). Data obtained from the first database was exported to the PGRFA database. This has lead to save time, avoid duplication of work and contribute to the PGRFA database input.

Sharing of agricultural research outputs will be more enhanced by raising awareness of decision makers within NARS for registering services at the CIARD RING; indentifying application tools for web based content generation and management of agricultural research that are commonly used and available at IARCs and supporting regional foras to implement those tools within NARS; targeting potential information producers made of researchers by providing support for capacity building on existing tools for information generation; making an inventory of successful information systems of agricultural research within national, regional and international levels that can be used as a model by other NARS and be subject to collaboration and linking those resources to the CIARD ring; documenting and reporting successful examples of interoperability; advocating for the use of shared vocabularies and frameworks at NARS level; supporting the use of non commercial interoperability tools (LOD) and finally agreeing on a blueprint for a global infrastructure for data exchange in agricultural research for development.

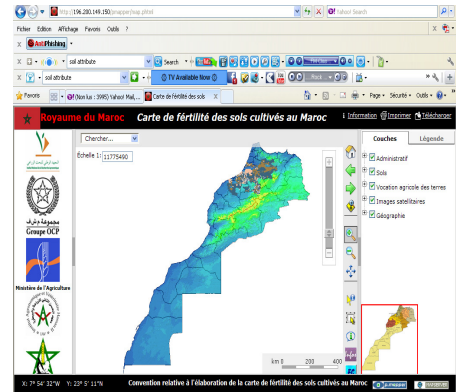
**Case Studies:**

1. Soil Fertility Map
2. Land Suitability maps
3. The World information sharing mechanism on the implementation of the global plan of action (GPA) for plant genetic resources for food and agriculture
4. Grape genome analysis: SSR identification and related Primer design
5. Web application tool for Potato genome analysis and SSR identification

## Soil fertility map in Morocco

**URL:** <http://196.200.149.150/pmapper/map.phtml>

Map of Moroccan soil project is conducted under agreement between the Ministry of agriculture, OCP group and NARS institutions (INRA, IAVHII, ENAMeknes) for a 5 years period (2010-2014) with the objective to develop a national map of soil fertility: Potassium, Phosphorus and Organic Matter, in addition to other classic soils attributes. This map will guide the rational use of fertilizer for better fertilization of cultures, to improve sustainable agricultural production in Morocco. It will also enable the development of regional averages of fertilizer formulas for the main crops that will allow the vast majority of farmers who do soil test analysis, to use more suited fertilizers formulas to their region conditions. First maps concern regions of Gharb-Chrarda, Rabat-Salé-Zemmour-Zaer Chaouia-Ouardigha and Meknes Tafilalet. 8000 soil tests were conducted besides a training program on Geographic Information Systems and GPS to the benefit of researchers and technician involved in the project.

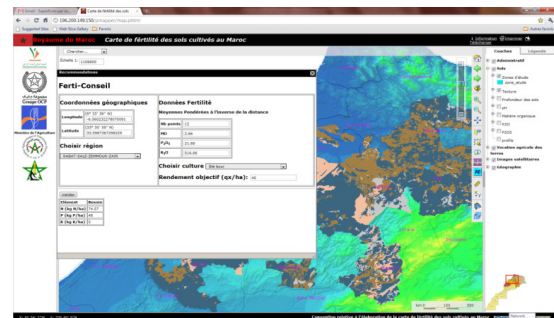


Information Data:

Documents, thematic maps, and statistics.

Subject scope:

Soil (soil depth, texture, soil horizon, soil fertility (phosphorus and potassium, organic matters), crop forecasting, land suitability for major crops (Triticum, barley, oats, olive, sunflower, Maize), topographic data, administrative data (cities, villages, road network), dams network, rivers, water resources (surface and underground), climatology forecast and desertification



Amount of digital data: 753 Mb

### Ownership:

The Map soil fertility project is coordinated by INRA with partnership of NARS (IAVHII, ENAMeknes). Data will be hosted at INRA and will be publicly used.

<http://196.200.149.150/pmapper/map.phtml>

Used tools and Standards:

Mapserver version 5.2.6 for map engine

PHP V.5.2.6 for PHP script interpreter

Cartoweb for framework and navigation

Postgresql 8.4 as a DBMS

PostGIS for spatial data management

Phppgadmin 4.2.2 for DBMS administration

## Land Suitability maps:

Land use and management is based on land suitability maps that combine ecologic, technologic, economic and social data. In order to optimise use of land resources within Morocco. A collaborative project coordinated by INRA was initiated in 1999.

the project is targeting useful agricultural areas (SAU) which count for 6 millions of hectares by 2010.

Information Data:  
Maps, documents

Subject scope:  
Soil data, Climate and crop data



### Ownership:

Coordinated by INRA with partnership of Directorates of Agriculture and Development Agricultural Agencies (ORMVAs).

### Amount of digital information: 300 Mo

This data is accessible on the Net through the Map of moroccan soil fertility website.

<http://196.200.149.150/pmapper/map.phtml>

### Tools;

Fortran for data interpolation

Surfer for output maps

ArcGis tools for map production and database management on soil, climate and crop

GIS tools are only used to generate thematic Maps on land suitability combining soil and climate data.

### Information management standards:

Tools and models based on international standards

FAO Ecocrop and LGP "Lead Growth period" Model

The World information sharing mechanism on the implementation of the global plan of action (GPA) for plant genetic resources for food and agriculture: <http://www.pgrfa.org/gpa/mar/welcome.htm>

A network of public and private institutions which conserve and/or use plant genetic resources with an objective to share information related to plant genetic resources and, in particular, to the implementation of the Global Plan of Action (GPA) on Plant Genetic Resources for Food and Agriculture (PGRFA)

**Information type:**  
Resources genetic data (crop species), documents

**Subject scope:**  
Plan genetic resources management ( In Situ Conservation and Development and Ex Situ Conservation )

**Amount of digital information:** 68 Mo

**Ownership:**  
Coordinated by INRA with partnership of major NARS (Hasan II of Agronomic Institute, Enamknes, National institute of forestry, and other Ministry of agriculture Directorates



Mecanisme National d'Exchange d'Information sur la MISE en ŒUVRE du PAM

BOURSES D'ACTIVITE PRIENRIERES | INDICATEUR COMMUN | ENSEIGNEMENT | FORMATION | DOUANE

Le Tableau 'ORGANISATION' (installs) contient de l'information sur les instituts, organisations, réseaux, ou leurs structures subordonnées. Le champ 'organisations mères' est utilisé pour établir une hiérarchie entre les entrées.

ID-ORG	Nom de l'organisation	Acronyme de l'organisation	WIEWS Instcode	Organisation mère	Adresse	Ville	Pays
010001	AMADECCA		ML030		B.P. 1721	Bamako	Mali, République du
010002	Association des Mili, Sorgho, Institut du Sahel	INSAH	ML033		B.P. 1530	Bamako	Mali, République du
010003	Association des agriculteurs du Mali	AAM			Rue Koulkani 23	Bamako	Mali, République du
010004	Bureau de la Documentation et de l'Information - Bureau des Sciences Génétiques	BISG-DBI	ML047		B.P. 259	Bamako	Mali, République du
010005	Centre canadien d'étude et de coopération internationale	CECI			Chemin de la République	Bamako	Mali, République du
010006	Centre de coopération internationale en recherche agro-pastorale pour le développement	CIRAD	ML005		B.P. 439 Sottuba	Bamako	Mali, République du
010007	Centre de Recherches Agronomiques de Sikasso (Coton et Fibre)	ERI	ML042		NTIata	Kouliko	Mali, République du
010008	Centre de Recherches sur le Coton	CRC	ML022			Cercle, N'Guisa	Mali, République du
010009	Centre de Recherches sur le Riz	CHR			B.P. 659	Bamako	Mali, République du
010010	Centre de Technologie des Bois de Sikasso	CTBS	ML010			Kouliko	Mali, République du

Version 2.0.0

<http://www.pgrfa.org/gpa/mar/welcome.htm>

**Tools**

Use of open source programs  
Java Servlet and Javaserer pages  
McKoi V94 as DBMS  
XSL (Extensible Stylesheet language) as XML interpreter  
Tomcat 4.1.24 as webserver

Grape genome analysis  
SSR identification and related Primer design

A tool for searching for SSR or Short Sequence Repeat (SSR) in the entire genome of grape (Vitis vinifera), and design of SSR markers for identifying genes or screening for disease such as mildew and fan leaf vidrus Grape genome consists of 190 contigs, and 2,745,612 SSR. Of Microsatellites grape genome



## Information data types:

Genome data

## Subject Scope:

Biotechnology, genetics and breeding

## Amount of digital data:

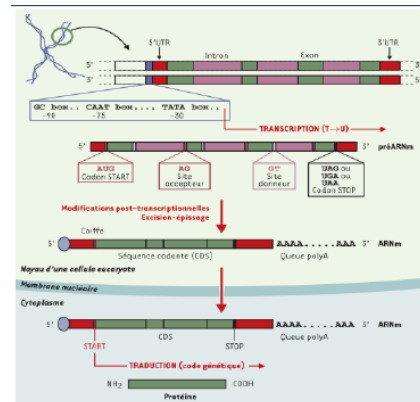
85 Mo

## Ownership:

INRA . system is being accessed locally by INRA researchers (biotechnologist) .

## Tools:

NCBI (National Center for biotechnology information [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov)) database  
MISA (Microsatellite) algorithm for SSR identification  
programming SSR research  
Use of Primer3 for Primer PCR identification  
Perl program for scripts  
Activeperl interpreter for Perl script running  
PHP language for web bioseq design  
Mysql as DBMs  
Apache as web server



## Web application tool for Potato genome analysis and SSR identification

A tool for searching for SSR in the coding and non coding areas of potato.(solanum tuberosum L.) genome and Sequence tagged microsatellite STMS markers applications in genetic and breeding.

### Information data types:

Genome data

### Subject Scope:

Biotechnology, genetics and breeding of Potato

### Amount of digital data:

**380 Mo**

### Ownership:

INRA . system is being accessed locally by INRA researchers (biotechnologist) .

### Tools:

NCBI (National Center for biotechnology information [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov)) database

MISA (Microsatellite) algorithm for satellite identification

Promoter **prediction** tools (**SoftBerry (TSSP)**).

Use of Primer3 for Primer PCR identification

Perl program for scripts

Activeperl interpreter for Perl script running

PHP language for web SoSuTA design

Mysql as DBMs

Apache as web server

Accueil  
S. Tuberosum  
Recherche  
Liens utiles  
Outils

SoTuSa  
Solanum Tuberosum microSATellites

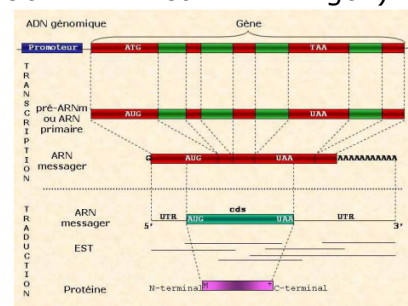
BIENVENUE SUR SOTUSA

SoTuSa (Solanum Tuberosum microSATellites) est le nom de ce site web dédié spécialement à l'espèce Solanum tuberosum afin de faciliter la consultation de la base de données spécifique pour la recherche des microsatellites dans toutes les composantes des gènes de cette espèce.

Ce site a été construit dans le cadre de la préparation du projet de fin d'études pour l'obtention du diplôme du Master Bioinformatique de la Faculté des Sciences de Rabat, Université Mohammed V - Agdal, promotion 2008/2010, durant un stage de six mois effectué au sein de l'Institut National de la Recherche Agronomique INRA.

Le sujet porte sur l'identification des Microsatellites dans la partie non codante du génome de la pomme de terre et l'automatisation de la procédure par une application informatique.

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