



المعهد الوطني للبحوث الزراعي
Institut National de la Recherche Agronomique

Kingdom of Morocco



Ministry of Agriculture
and Fisheries

INRA

**Colossal Achievements and know-how
for Sustainable Development
of Moroccan Agriculture**



From the Director

Professeur Mohamed Badraoui

For nearly one century, INRA has been evolving in terms of organization and research strategy. Indeed, INRA has always managed to adapt its intervening structures, its research programs use tools and means specific to the socio – economic environment prevailing at each phase of its history.

Thanks to its research achievements, INRA is among the national institutions that have contributed significantly to the modernization of the Moroccan economy through basic knowledge produced and the technologies developed by its researchers.

In this regard, the regional dimension is a strategic priority. Thus, we are working to preserve client oriented research achievements and to consolidate regional anchorage. Our will is strongly expressed by the involvement of our partners, stakeholders and regional operators in orienting, monitoring and using research results. This is also the role of The Regional Councils of Agricultural Research which are important forums for holding debates and keeping information exchange.

In addition, communication and technology transfer is a key element of our vision. We are sparing no effort to promote internal and external communication and improve information management. Nowadays, INRA has a solid basis to achieve defined objectives and, thereby, support the new Government Agricultural Development Strategy "**Green Morocco Plan.**"

Meanwhile, the opening up and partnership dimension is also a field for us to further strengthen collaboration at the national and international levels for better use of research results and for raising Research and Development to a level in harmony with public and private operators' needs.

Our asset is the human capital that we are developing for an effective and efficient research oriented to better serve our agriculture and rural communities.

INRA, An evolving institution

2003 :

Implementation of the new INRA organizational chart focused on client oriented research.

1980 :

Creation of "INRA".

1948 :

Publication of a Journal "Les Cahiers de la Recherche Agronomique" followed by a second journal "Al Awamia" to strengthen information dissemination previously provided by "Les Cahiers de la Recherche Agronomique".

1939 :

Creation of "The Soil Studies Laboratory" which was the basis for soil science development.

1934 :

Strengthening of research infrastructure through setting up a well equipped Agro-chemical Laboratory which had a decisive role in the start of modern agricultural experimentation. "The Department of Agricultural Experimentation" becomes the Agricultural Research Centre the main mission of which was to promote, coordinate and monitor all research activities in Morocco.

1924 :

Creation of "The Station of genetics and seeds tests". It is considered the first link with agricultural research in Morocco.

1919 :

Creation of "The Agricultural Experimentation Service" under the Agriculture, Colonization and Forest Department.

1914 :

Creation of two experiment stations to meet the priority needs that moved of settlers progressively in favorable and fertile rural areas.



INRA, Clearly Defined Missions

Our missions:

- To carry out scientific, technical, and economic research for the development of agriculture and livestock;
- To undertake prospective studies, especially those related to natural environment and/or agriculture and livestock production systems improvement;
- To undertake, either on its own initiative or at the request of individuals, trials on new crops or crops to improve, and also in general to conduct all forms of agricultural experimentation related to the development of techniques for the processing and utilization of plant and animal products;
- Within its field of competence, ensure monitoring and evaluation of research, studies, or other work conducted on behalf of public agencies;
- To ensure dissemination of information on its own research and research carried out abroad ;
- To examine and determine scientifically the practical procedures for research results application and to advise extension organes and farmers;
- To market the results of its research and studies.

INRA Medium and Long Term Research Strategy

Our strategic objectives

- Improving productivity, competitiveness and sustainability of agricultural production;
- Characterization, preservation and valorisation of natural resources;
- Quality Improvement, valorisation and diversification of plant and animal products;
- Analysis of social demand and production systems.

Our strategic areas of activity

- Plant and animal breeding;
- Development of methods for plant diseases and pests control;
- Agro-ecological characterization of natural environments;
- Conservation and valorisation of natural resources and agricultural products;
- Development of methods for the valorisation of agricultural products;
- Research & Development through the participation of investors, farmers, extension agents and civil society;
- Development of new technical package for crops and animals;
- Socio-economic studies.



Date palm culture *in vitro*



Date palm collection in Zagora

INRA, Appropriate structures and qualified Human Resources

Good Quality research set up

■ Eight multidisciplinary scientific departments working on:

- Environment and natural resources;
- Food technology and quality;
- Agronomy and agricultural mechanization;
- Plant protection;
- Rural economy and sociology;
- Animal production;
- Improvement and conservation of plant genetic resources;
- Research and development.



Seeder with animal traction

■ 30 multidisciplinary research unities acting for achievement of different research and research-development actions.

A qualified human potential

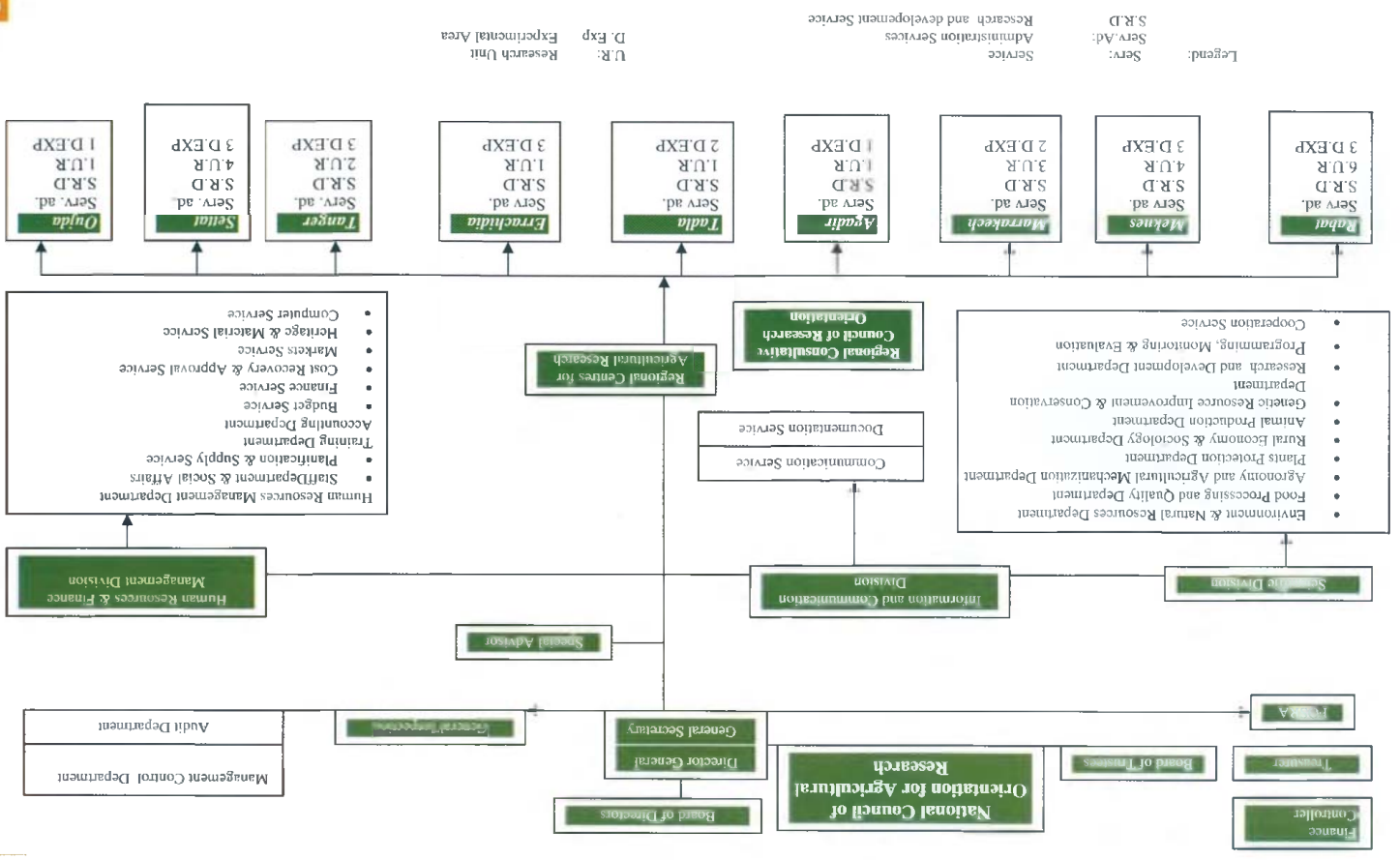
- 191 Scientists (15%); 213 technicians (17%); 42 managers. (3%)

Client oriented research

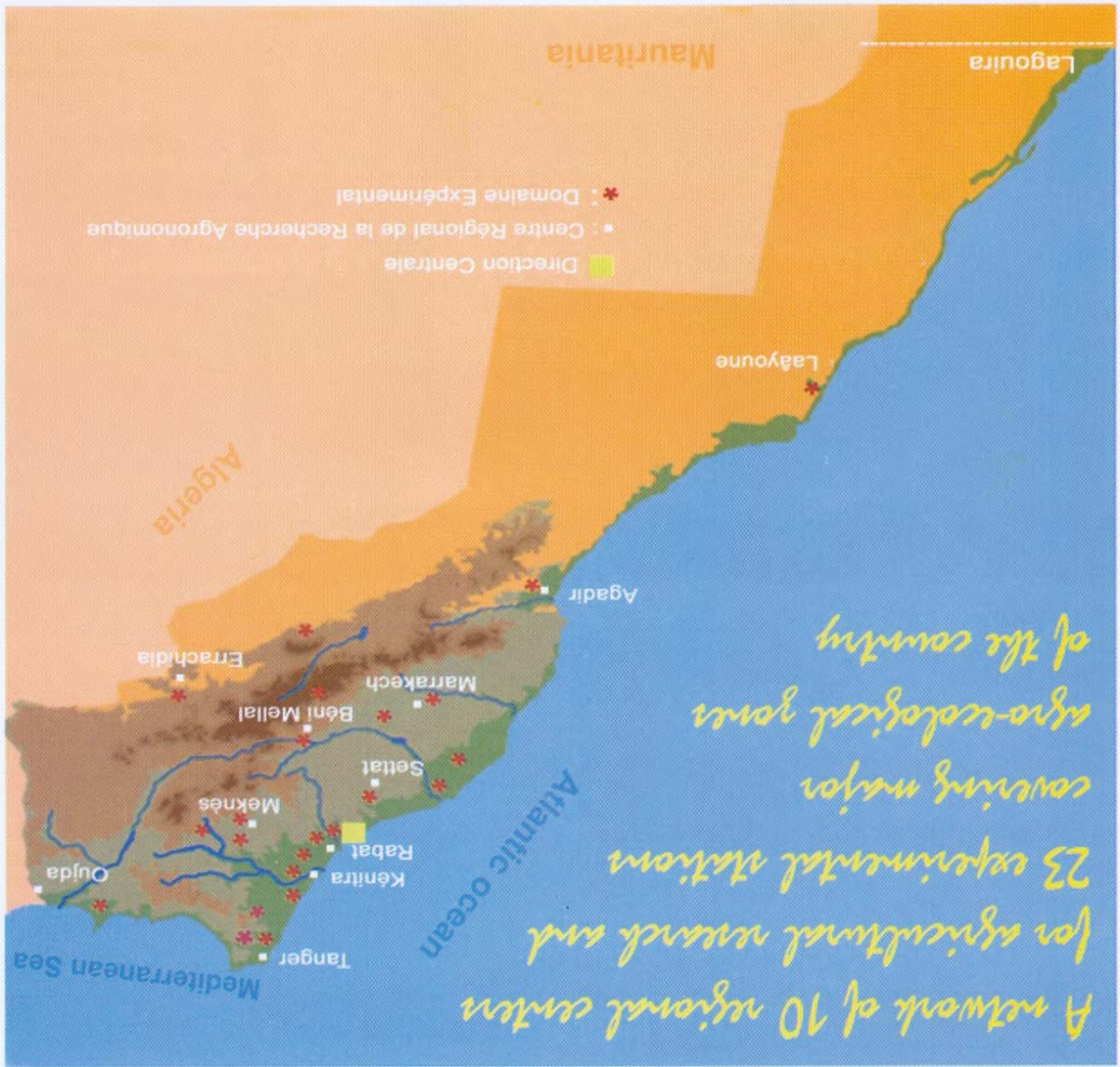
Actually, ten regional centres for Agricultural Research covering different agro-ecological zones of the country and having a medium-term research work plan based on orientations and guidelines determined with regional partners. Research projects are complementary and deal with different production sectors and diverse regional centres mandate zones.



Organizational Chart of The National Institute for Agricultural Research



CRRA	Experimental stations
Agadir	Melk Zhar, Laâyoune
Errachidia	Zagora, Errachidia
Kenitra	El Menzeh, Sidi Allal Tazi
Marrakech	Tassaout, Saâda
Meknès	Aïn Taoujdate, Douyet, Annoceur
Oujda	Bouareg
Rabat	El Koudia, Botanical Testing Garden, Marchouch
Settat	Jemâa Riaâ, Sidi El Aïdi, Jemâa Shaim, Khemiss Zemamra
Tadla	Droua, Afouzer
Tangier	Bougdour, Boukhalaf, Larache
Total	23 experimental stations



27 Research orientations adapted to Regional needs

CRRRA	action area	Research orientations
Agadir	ORMVA Souss Massa DPA Agadir Tiznit	<ul style="list-style-type: none"> Water management and development of new production options. Development and valorization of "Terroir product".
Errachidia	ORMVA Ouarzazate et Tafilalet DPA Figuig, Tata, Guelmin, Tantan, Laâyoune, Smara, et Boujdour	<ul style="list-style-type: none"> Improvement of sustainable production systems, management of oasis and semi-desert rangelands. Development of palm tree sector.
Kenitra	ORMVA Gharb, Loukkos DPA Kénitra et Sidi kacem	<ul style="list-style-type: none"> Improvement of the productivity and competitiveness of citrus. Intensification and diversification of production systems.
Marrakech	ORMVA Haouz DPA Chichaoua, Essaouira, El kalâa des sraghna et Marrakesh	<ul style="list-style-type: none"> Development of olive sector. Contribution to the rehabilitation of palm tree and valorization of product Development of production systems in marginal lands.
Meknès	DPA Boulmane, El hajeb, Fes, Ifrane, Khénifra, Meknès, Taounate, Taza et Sefrou	<ul style="list-style-type: none"> Integrated crop management of fruit trees Sustainable intensification and diversification of cropping systems. Management of natural resources and dynamic in mountainous zones.
Oujda	ORMVA Moulouya DPA Nador et Oujda	<ul style="list-style-type: none"> Conservation and sustainable management of rangelands. Sustainable intensification of irrigated production systems.
Rabat	DPA Ben slimane, Khémisset et Rabat-Salé	<ul style="list-style-type: none"> Sustainable agricultural production systems management in semi-urban areas Improvement of productivity and quality of agricultural products using biotechnology and others process.
Settat	ORMVA Doukkala DPA Casablanca, El jadida, Khouribga, Settat et Safi	<ul style="list-style-type: none"> Impact of climate change in arid and semi arid areas. Development of adaptation strategies to draught. Diversification of production systems and integrated crop management. Improvement and conservation of genetic resources. Organization and strengthening of local community capacity.
Tadla	ORMVA Tadla DPA Beni mellal et Azilal	<ul style="list-style-type: none"> Irrigation management. Intensification and diversification of agricultural production systems in lowland and mountains.
Tangier	ORMVA Loukkos DPA Tanger, Tetouan, Chefchaouen et Al hoceima	<ul style="list-style-type: none"> Improvement of goat production systems for meat and milk. Diversification of agricultural production systems in lowlands and Mountains for better natural resources management.



Cactus jam



Cacti plant



Conserved cactus racks

INRA, Research results to upgrade Moroccan Agricultural sector

Biotechnology:

Good progress in biotechnology research and in vitro propagation.

Enrichment of the gene of bank

- 22.000 accessions of different species (cereals, food legums...)
- 8.000 accessions of durum wheat mutants (genetic stock).

Species	Achievements
Cereals	<ul style="list-style-type: none"> • Development and use of genetic markers associated to drought resistance, characterization of races of rust, septoria and pyrenophora spp. • Inducing gene resistance to drought.
Food legumes	<ul style="list-style-type: none"> • Use of genetic markers for Lucerne Drought control. • Inducing gene resistance to orobanche in faba bean.
Agrumes	<ul style="list-style-type: none"> • Molecular characterisation of fungi stumps antagonists to citrus blue moulds.
Date Palm	<ul style="list-style-type: none"> • Date palm inflorescence propagation.
Vine	<ul style="list-style-type: none"> • Development of Virus-Free Plant using <i>in vitro</i> meristem culture.

Large-Scale crops

Achievements portfolio testify of the pertinent role of INRA in upgrading agricultural sector at the national level. The outcome, both rich and varied, is characterised by registration in the Moroccan official catalogue of **216 varieties** adapted to diverse Moroccan agro-ecological zones.

Espèces	Nombre	Espèces	Nombre
Durum Wheat	35	Winter Chickpea	7
Soft Wheat	25	Spring Chickpea	3
Barley	24	Lucerne	3
Oats	17	Vetch	9
Triticale	7	Lens	8
Rye	3	Forage Peas	4
Annual Luzerne	3	Peas	2
Irrigated Maize	16	Cotton	9
Dryland maize	5	Sunflower	4
Rice	17	Soybean	7
Vicia Faba	3	Carthamus	1
Faba Bean	3	Rapeseed	1

Total

216

Olive

Within the Olive Improvement Program, 8 millions olive trees of the INRA's new varieties **Menara and Haouzia** were distributed to farmers. In addition, a new olive oil variety **"INRA MANZxPL"** was selected and is currently under protection. The main characteristics of these varieties are as follows :



"Menara" olive variety

Varieties	Features	
Haouzia and Menara	Production	55 Kg / Tree
	Oil content	23-24% Dry matter
	Alternate cropping rate versus Moroccan picholine	30%
New olive oil variety INRA MANZxPL	Highly productive	60 Kg / Tree
	High Oil content	40% Dry matter
	Acid	0.19%

A range of cultivars adapted to the Moroccan agro-ecological conditions:

Espèce	Nombre
Peach	28
Ficus	26
Almond	13
Apricot	10
Apple	4

Espèce	Nombre
Pomegranate	3
Avocado	3
Pecan	3
Pistacia	2
Cherry	2

Total

89



Date Palm:

Najda variety is a turning point toward Moroccan date palm rehabilitation. Its main features are the agronomic traits: time of pollination on March, very long floral receptivity after spathe opening, fruit season, average temperature requirement for the maturity of the fruit, high productivity, date good presentation and appearance, good ability for fruit conservation and resistance to bayoud fusarium disease. More than 450,000 plantlets were propagated and distributed to farmers.



Najda variety

Development of new citrus varieties productive and adapted to market requirements:

	MAND INRA1	MAND INRA2	MAND INRA3	MAND INRA4	MAND INRA5
Aspect	Flattened	Flattened	Flattened	Round	Flattened
Color	Red	Orange	Orange	Orange	Orange
Peeling	Easy	Easy	Easy	Easy	Easy
Firmness	Good	Good	Good	Good	Good
Maturity	Semi Early	Early	Semi Early	Semi Early	Early
seed	Limited number	Limited number	Limited number	Limited number	Limited number

3 new triploidy hybrids of good quality sperms are currently tested at the INRA experiment Station in El Menzeh.. These new varieties are currently to be covered by the plant protection act. They will be released once protected

Sélection of associated varieties / rootstock

Technologies	Features
<p>Selection of associated varietie/rootstocks :</p> <ul style="list-style-type: none"> - Citrange Troyer/ Sidi Aissa Clementine for the Gharb region (Morocco) - Citrus volkameriana and Citrus macrophylla with Nules and Nour Clementine along with Late Clementine for the Souss region (Morocco) 	Adapted, productive and of good quality
New rootstocks obtained through crossbreeding	Some are grafted for seeds production others for propagation and testing

Microbiological control

- Post harvest biological control of citrus rots is performed with a new bio fungicide based on a Moroccan strain (Z1) that was isolated from citrus fruit surface at the Phytopathology Laboratory in El Menzeh (CRRRA Kénitra). It is an alternative way to chemical control operated in the packing stations which are harmful to fruit quality, human health and environment, due to remaining residue on the fruit. This work was awarded with Hassan II Prize for invention and research in the field of agriculture at the World Food Day 2007.



Yeast strains

Integrated Pest Management

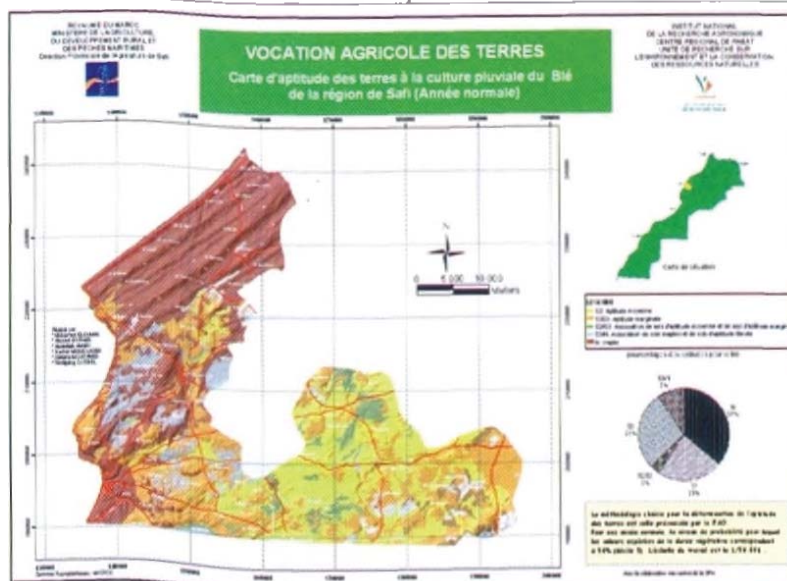
INRA has developed an "integrated biological control" method to control crop pests. It is an alternative way to the excessive use of chemicals. It helps reduce more than 50% of chemical treatments.



No till seeder

Land suitability maps : Decision-making tools

Maps	Ha	Covered regions
Produced maps	4.5 millions	Oujda, Taza, Fes, Tanger, Settat, Safi, Taounate, Ben Slimane, Khémisset, Kelaa de Seraghna, Tiznit, Khénifra et régions zaër.
Maps currently under development	1 millions	Tiznit, Sidi Kacem, El Hajeb, Meknès et khouribga.



Animal production : Some tested results for small ruminants

- Lamb animal growth and better carcass obtained by crossbreeding Texel x Timahdite breeds.
- Improvement of boujaad sheep breeds fertility rate by 92% using D'Man rams and weaning weight increase of 24 kg for young sheep and 33 kg for adult sheep.
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- Selection of a new synthetic sheep breed (INRA 180) combining prolificity, hardiness and meat quality by crossbreeding D'man and Timahdite local breeds.
- Genetic resources characterization of local goats from North and Draa.



D'man

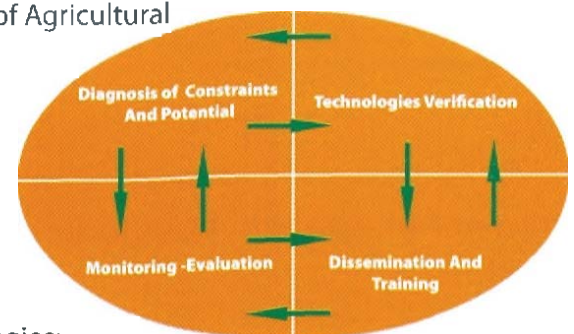
Products valorization: developing new products

Main developed food products are: Date Amlou; Spread food based sirop from figs, peanuts, almonds and olive; olive oil; dried green olives; dried and sweetened black olives; and Lupin couscous. These new products were developed using simple and inexpensive process designed to transform products with low added value. Some of these technologies are already used by local NGOs such as **Aknari - Tiznit** which markets cactus products and the Kadiria association in Marrakech, which is working on date pulp production.

Our approach: Sharing knowledge and transform it to know-how

- A participatory, systemic and iterative approach involving customers and partners feedbacks for research needs definition and use, through the Regional Advisory Councils of Agricultural research.
- The Research and Development Units within the Regional Centers of Agricultural research are interacting between research and extension to :

- Potential needs identification of technologies;
- Proposal of a range of solutions;
- Technology verification in rural areas;
- Impact monitoring and evaluation of proposed technologies;
- Results dissemination.



R & D Demarche

L'INRA

Your Everyday Partner

An institution open to its environment

Opening up its scientific, technical, economic and institutional environment has been a priority for INRA, which entertains partnerships with different research and development stakeholders including national and international organizations

On the other hand, INRA is an active partner of both international and regional organizations mainly (CGIAR, ICGEB, AARINENA, FARA, CABI, IOC, ICARDA, CIMMYT, and others). Moreover, INRA is a member of several regional networks and maintains bilateral relationships with several countries



Formation accompagnatrice du transfert de technologie

Outlook

Five guiding principles of Research strategy at INRA: i) **regional dimension**, in harmony with the new Ministry of Agriculture and Fisheries's rural development strategy 2009-2015, to preserve achievements and further consolidate client oriented research anchor ii) **research dimension** resulted from medium-term research program tailored to regional needs for the period of 2009-2012 in harmony with the government strategy "**Moroccan Green Plan**" iii) **communication and technology transfer dimension to disseminate research results to producers** iv) opening-up and partnership dimension at national and international levels to better capitalise on our acquired research and raise research level and its **modernization** and v) social dimension based on development of INRA's staff for an effective and efficient research and revitalization of workers' social affairs.

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