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The Moroccan system of agricultural research

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I - Institutions

The Moroccan system of agricultural research is quite well diversified. Those institutions which engage in such research (to varying degrees as dictated by the special nature of each) may be classified under the following five headings:

- National Institute of Agricultural Research (INRA)
- higher agricultural educational establishments
- development agencies and authorities
- central directorates of the Ministry of Agriculture
- professional bodies; governmental and private companies.

1. National Institute of Agricultural Research

This is the only public institution in Morocco that is specialized in the field of research. Set up in 1981 as a public establishment with legal status and financial autonomy, it replaced the Agricultural Research Directorate (DRA), taking over the major portion of that agency's personnel, assets and responsibilities. INRA is thus the culmination of a long history beginning in 1919

(creation of the Rabat Experimental Garden and of two experimental stations at Rabat and Fez), a development marked by a gradual increase in the number of research structures and activities which in time became more and more diversified and which make up a particularly complex system. According to law number 40-80 of 9 April 1981, under which it came into existence, INRA is charged with the following specific responsibilities:

- to engage in scientific, technical and economic research aimed at the development of agriculture and animal husbandry;
- to conduct exploratory studies having to do with the natural environment as well as with the improvement of agricultural production; and
- to undertake experiments dealing with new crops, with improvement and livestock production, and, in general, to carry out all experimental operations relative to agriculture as well as the transformation and utilization of plant and animal products.

INRA employs a permanent staff of 2,225 people, including 228 researchers, 461 technical assistants and agents, and 1,535 workers and administrative employees.

In terms of organizational structure, a distinction can be drawn between the various types of services. The central services include: ecology, fall

and winter grains, oleaginous crops, sugar plants, textiles, feed crops, leguminous edibles, olive trees, orchard farming, medicinal and aromatic plants, technology, and crop improvement. A scientific division heads these central services; it initiates, supervises and interprets most of the research projects conducted at the Rabat level as well as at the regional level.

The second structural entity consists of the regional services, of which there are 11. Known as Regional Centers of Agricultural Research (CARRA), their function is to coordinate and manage the experimental and regional stations which are the cellular elements, as well as those scientific services that had been decentralized for whatever reason.

The regional stations and the decentralized entities have been set up so as to immerse themselves in the environment pertinent to the character of their respective research responsibilities.

For example, the central station for citrus growing is located in the Gharb, which is the country's main region for citrus fruit. The central station for truck farming is located at Agadir, in the area noted for its fine spring vegetables. The central station for silkworm breeding is at Meknes.

Further, we find the radioelement laboratory at Tangiers, the central station for Saharan agronomy at Marrakech, and the dryland culture project - *Projet Aridoculture* - at Settat. This project, a highly important one for Morocco, was recently created within the framework of cooperation with the USA. It is designed to study development problems in the semi-arid zones of the country where rainfall measurements are between 200 and 400 mm and which include 40% of the total arable surface in the nation. This center is called upon to make use of 32 Moroccan researchers on a travel basis in addition to foreign researchers.

Most of these stations and projects have at their disposal an experimental network in other regions.

In addition to the regional and decentralized stations, there are 42 experimental stations and 22 applied farms located all over the country, reflecting the dimensions and diversity of the country as well as the extent and importance of its agriculture. They also take into account the

demands imposed by research which needs to carry out observations and experiments in a broad spectrum of natural and human environments. This network of experimental areas constitutes a national land asset of 8,134 ha, which is indeed a lot of land. This territory does not serve for research purposes alone: it is also used for producing basic seed crops.

Research subjects undertaken by INRA have to do with all aspects of plant and animal production, with the exception of forestry, a special field which falls under the responsibility of the Directorate of Waterways and Forests and certain bureaus of the Rural Engineering Service. INRA has a board of directors whose chairman is the Minister of Agriculture and Agrarian Reform.

2. Higher educational establishments in agriculture

In contrast to the situation prevailing in a number of countries elsewhere in the world, in Morocco the function of higher education in agriculture is ensured by institutions (schools and institutes) under the Ministry of Agriculture. For these establishments, which bear the responsibility for training, research is an essential activity for the quality of instruction and for realistic teaching methods.

The oldest of these establishments is the National School of Agriculture at Meknes, but the most important is the Hassan II Agricultural and Veterinary Institute (IAV). The first class to graduate from the IAV was in 1967. At that time it was aimed at training State agricultural engineers, alongside the Meknes school which trained applied engineers. Since then IAV has continued to develop steadily, broadening its activities to include the training of veterinary doctors, the creation of new subsidiaries or branches, etc. The *Dahir* (law) of 2 January 1984 officially confirmed its existence in the capacity of "a public establishment charged with the mission of dispensing scientific instruction pertaining to agriculture as well as contributing to such studies and research as may be required for such instruction".

Based at Rabat, IAV has an annex at Agadir in the form of a horticultural complex. The institute has 11 branches with two levels of long-term training (*baccalauréat* plus six years) for State engineers and veterinary doctors, and one level of short-term

training (*baccalauréat* plus four years) for applied engineers.

The programs are as follows:

Long cycle: Agronomy (20 specialized areas), food and agriculture industry (long cycle), wood technology, veterinary medicine

Short cycle: food technology, rural works, topography, farm machinery, horticulture, landscaping, fisheries.

The branches are organized into instruction and research units encompassing the scientific departments. These units are subdivided into 36 departments, including, for example, basic sciences, rural engineering, soil science, agronomy, zootechnology, entomology, phytopathology, horticulture, technology, veterinary medicine and forestry.

IAV has two large experimental farms located in the Gharb and the Tadla, which are among the most important regions in the country, and also an estate at Agadir attached to the horticultural complex.

There are 350 research instructors divided between Rabat and Agadir

3. Central Directorates of the Ministry of Agriculture

Within the framework of their respective responsibilities, some of the central directorates perform specific experiments and may have at their disposal laboratories for analysis and control. Such is the situation in the case of the Directorate for Plant Protection, Technical Control and Repression of Fraud (agricultural notices and announcements, catalogue orders and subscriptions, official analysis laboratory); the Directorate for Livestock Raising (supervision of one of the vaccine-producing laboratories, control of meats and animal-origin products); the Rural Equipment Directorate (rural engineering experimentation); and the Directorate for Waterways and Forests (everything to do with forestry).

4. Development Agencies and Authorities

The main bodies in this category are the Regional Offices of Agricultural Development (ORMVA) and the provincial directorates of agriculture. The

regional offices concerned with agriculture in areas served by major hydraulic installations have Experimental Agricultural Development Stations (SEMVA), which, in addition to irrigation studies, engage in hypothesis-testing experiments on the behavior of new species and varieties to be introduced into their respective action areas. As for the provincial directorates, they are responsible for rain-fed agriculture. They are mainly involved in carrying out demonstration tests via their local intervention units, known as work centers (CT). In matters relative to integrated regional development projects of concern to them, they undertake the necessary research with the help of more specialized bodies.

5. Companies and Professional Organizations

Some government companies that manage State lands, for example, the Agricultural Lands Management Company (SOGETA), or that were set up to promote the development of particular sectors -among others, the National Livestock Development Company (SNDE)- engage in experimental activity on a marginal basis. The same is true of some professional service companies, of which a good example is the Agricultural Services Company of Morocco (SASMA).

The private companies (agro-industry, inputs trade) pursue their own research, which is diffused, secretive and little known. In terms of total volume, however, it does not appear very large as it responds to the strict criteria of profitability. Involving, in particular, imported inputs (hybrid seeds, plant hygiene products), the most interesting research is done by the parent companies abroad. Only the screening or the catalogue experiments are done locally with the involvement of public agencies.

From the somewhat lengthy account given above of Moroccan institutions involved in research, two facts emerge:

- the system allows scope equally to the public and the private sectors on the basis of the research interests of each;

- among the public agencies and authorities, two play a leading role thanks to their human and material capabilities, namely INRA with research as its sole and unique concern, and IAV as the foremost educational institution in the agricultural field (see sections V and VI below).

II - Relations of the national system with other activities

First of all, we should consider the relations within the system itself between the various parties involved. Liaison relationships exist among the institutions in the public sector as well as between the public and private sectors. On the former side, working agreements have been drawn up with respect to cooperation among a good number of parties. One of the most important of these cooperative agreements is the one between INRA and IAV, the two leading scientific research institutions with complementary human and material resources. By the terms of that agreement, these two establishments take it upon themselves, among other things, to undertake a greater degree of mutual consultation, to implement joint research programs, to facilitate exchange of researchers and research instructors, and to cooperate in the task of providing better training for future key personnel in agriculture as well as in research and teaching. Liaison likewise exists between public institutions and private companies. As regards cooperation with scientific institutions not directly related to agriculture, existing links are still somewhat tenuous, and should be strengthened particularly with respect to the sciences and economics departments. These departments can be of service in the field of basic research.

Contacts are plentiful between researchers and the rural population including farmers. Researchers from INRA and from educational establishments, as well as representatives of the various agencies concerned, participate in the task of bringing knowledge to the people within the framework of action programs conducted by the extension services. Other activities along these lines include information days, seminars, and visits of experimental stations organized for the benefit of the users. The farmers, for their part, participate in research orientation to the extent that they are represented on the board of directors of the autonomous institutions as well as at various periodic conferences held at the regional level.

In the future, all of these relationships will be improved and expanded, among the parties concerned - public agencies, private companies, farmers and university. INRA, in particular, has

every intention to play its rightful part to the hilt in this respect; it is now in the process of reorganizing under a master plan which it has drawn up with the assistance of the International Service for National Agricultural Research (ISNAR).

III - National organization of agricultural research

The supervision and guardianship of agricultural research is ensured by the Ministry of Agriculture. A National Scientific and Technical Research Coordination Center has just been created for the purpose of coordinating research in agriculture as well as in other directions. It will take time for this body to become adequately structured so as to properly fulfill its allotted functions.

Major research orientation decisions are made by the boards of directors of the autonomous institutions in which the ministries concerned are represented: Planning, Finance, Industry, Public Health, and so on. Decisions of this nature are made at the time that economic and social development plans are drawn up as well as such plans as may be proposed by the institutions concerned. The draft plan is discussed and approved by the board of directors, presented by the Ministry of Agriculture, then examined and in the final instance adopted by the agriculture committees of Planning and Parliament, with allocation of funds accordingly as far as investment credits are concerned. With respect to credits for operations, these are discussed at the outset with the Ministry of Finance once the proposed figures have been examined and approved by the board of directors.

In the final analysis, the allocation of funds across the board is made by the budget division of the Ministry of Agriculture. As for specific apportionment under budget item categories, this is the job of the institution itself and its board of directors, once the annual budget figure has been passed by the Ministry of Finance.

IV - Human resources

The table in the annex shows the personnel breakdown for the public sector in the area under discussion.

Scientists

It can be noted that the number of scientists employed is relatively low as compared with the total personnel in other categories. The number of workers is too high and should be reduced in favor of researchers. It should be further noted that the number of students working on their theses is from 350 to 400 per year.

The personnel status of researchers varies according to the institutions to which they are assigned. IAV instructors enjoy the same status as those who work at the university, which up to now offers the best salary opportunities. As for INRA researchers, the statutes provide for a generous research bonus that is practically tantamount to a salary. The INRA statutes have been so drafted during the past few years as to attract researchers to this institution. When all is said and done, there is not so great a difference between IAV and INRA, on the one hand, and the private sector on the other. The statutes of the development agencies and government companies, while they are relatively advantageous compared with civil service personnel policies, draw no distinction with respect either to remuneration or to promotion, between employees engaged in experimental work and other staff personnel at the same level.

As of January 1986, the advantages conferred by the statutes of the autonomous institutions *vis-à-vis* the civil service in general have been eliminated. A statutory provision has just been established for the position of civil service engineer. This new provision is much more interesting in all respects than any of the statutes existing heretofore, and these - particularly in the case of INRA and IAV - should be amended accordingly in order to maintain their drawing power.

At INRA and IAV, researchers and research instructors are now recruited competitively or by examination, or else upon approval by the department concerned. Elsewhere, they are selected most of the time from the pool of available technicians. The rules governing promotions are spelled out in all of the statutes. At INRA, as well as in the educational institutions, personnel eligible for promotion must show results before advancing in grade. The vast majority of researchers currently employed were trained in Moroccan institutions and went on, for the most part, to complete their education in France,

Belgium and the USA, the traditional host countries. For the time being, hiring and keeping good researchers is not a problem, although the statutes of the autonomous institutions will have to be updated to match those of the civil service.

Other personnel categories

As a rule, technicians are subdivided into specialized technical assistants, ordinary technical assistants and technical agents. They participate in research work.

The administrative agents have the job of managing personnel, preparing budgets, doing the bookkeeping, and handling orders and marketing. Strictly speaking, they do not administer research. Research units manage their own budgets and handle their own commitments at their level. Some of these administrative agents are administrative assistants; opportunities for further training are offered by the schools of public administration.

Fulltime workers are no problem as far as competence is concerned. They have job security, unlike seasonal workers or workers in the private sector.

Material conditions for personnel other than scientists vary somewhat according to the statutes. The main difference in this regard is that which prevails between the autonomous institutions on the one hand and the civil service on the other.

V - Material Resources

1. Material Resources

As previously pointed out, INRA has an impressive network of experimental stations all over the country. These stations, 64 in all covering a total of 8,134 ha, are managed by 12 regional centers: Tangiers, Kenitra, Fez, Meknes, Khemisset, Oujda, Settat, El Jadida, Beni-Mellal, Marrakech, Agadir and Laayoune.

IAV has three stations covering a total of 740 ha.

The table below shows the number of stations and the surface area used for research and experimentation.

Institutions	Number of stations	Area (ha)
INRA	64	8 134
IAV	3	740
Agriculture School	1	-
Water and Forests	-	40
Moulouya Station	3	25
Haouz Station	-	32
Ouarzazate Station	3	13
Souss Massa Station	2	-
Doukkala Station	2	33
Commercialization Station	4	6
SASMA	-	45
SOGETA	-	50
Gharb Station	1	60
Errachidia Station	1	30
Total	84	9 208

As for the national scientific heritage, INRA has at its disposal 35 laboratories which are generally well equipped with scientific materials. With office space included, they occupy 20,000 m². Five of these laboratories are decentralized.

At IAV, the laboratories and the rooms for practical work occupy over 40,000 m², or 50% of the total surface area of the buildings.

Waterways and Forests have four main laboratories, all of them located in Rabat. SASMA has a sizable analysis laboratory at Casablanca. The directorates for plant protection and animal husbandry have laboratories of varying size in some towns outside of Rabat, particularly in Casablanca. The buildings are generally in good condition.

Ample provision is made for reference materials. INRA and IAV have two impressive libraries housed in buildings of recent date.

The Directorate for Waterways and Forests also has a main library containing 10,000 volumes.

Results of research done by INRA can be found in the annual activity reports of the central stations and regional centers, in the seminar minutes or in compendium publications. INRA also has two scientific reviews: *Al Awania* and the *Agricultural*

Research Journal (Cahiers de la recherche agronomique).

IAV research results appear in dissertations written at the end of studies, in the review *Man, Land and Waterways*, and in the records of IAV.

The Waterways and Forests Directorate publishes the *Annals of Forest Research in Morocco*.

Researchers are also encouraged to publish in international scientific reviews.

The idea of starting Mediterranean reviews is being well received. Such publications would enable researchers to get to know each other better and to have closer contact with each other, all the more so since the problems they confront are of similar nature.

The breakdown of estimated financial resources for operations in the annex entitled "Human and financial resources in the public sector" shows that salaries account for two thirds of the credits: 100 million DH out of about 150 million DH. The number of scientists, however, is low, and should be increased at the expense of other personnel categories, in particular workers. The equipment budget is estimated at 40 million DH, the major investment in this direction having already been made in the past.

2. Financial resources

The financial resources earmarked for operations as well as for equipment are derived essentially from the national budget (Ministry of Agriculture and Agrarian Reform). Research contracts, which are still in the early stage, provide only meagre resources.

Bilateral and international aid, which is sometimes quite considerable, does not often go toward operations, where the problems are greater. Aid funds are generally used for procuring equipment and hiring experts, and they make it possible to provide for training abroad.

Because of the effect of the world situation on the national economy, the overall level of resources allotted to research has not evolved very much over the past several years.

VI - Research programs and results

As already pointed out above, in regard to the organization of national research, the general guidelines and major options for research undertaken by the specialized autonomous institutions are the outcome of a procedure involving the successive intervention of several centers of analysis and decision making. Thus, when each economic and social development plan is prepared, the institution concerned works out the project draft it is interested in, taking note of proposals from a number of sector committees formed at the headquarters level as well as at the regional level. In these committees, the research users are represented: farmers, industrialists, development agencies, administrations. The project is then discussed, and amended if need be, by the board of directors and subsequently by the agriculture committees of the Planning Ministry and Parliament. Once the project has been adopted in definitive form, detailed programs are proposed by committees of researchers.

Foreign relations do not generally exert any influence on research orientation. Bilateral and international cooperation is limited to providing the means for research areas judged to have priority by the appropriate national authorities. To be sure, the outside authorities providing the aid have to be persuaded, on their side, that the choices made are correct.

Evaluating the results of a research project or of work done by a team of researchers is done in various ways which may be complementary. These include assessment by superiors in the hierarchy, the degree of satisfaction expressed by users, evaluation by a committee containing eminent researchers from other institutions, and, finally, the opinions of consultants. This evaluation procedure may serve equally well for subsequent orientation of research, with corresponding allocation of funds, and for the promotion of researchers.

The summary breakdown, in percentages, of agents occupied in research among the sub-sectors is as follows:

- Plant production 73%
- Animal production 10%
- Forestry 4.2%

- Agricultural industry 4.4%
- Water power 5%
- Socio-economic 2%
- Other 1.4%

Because of its diversity and the extent of its problems, plant production takes up the majority of available research personnel. Animal production should be upgraded in this respect.

There are many areas in which, depending on the possibilities, cooperation could be improved between ICAMAS and the leading Moroccan research institutions (INRA, IAV, Waterways and Forests).

Here are some of the areas in question:

- studying water needs and requirements,
- ecology (erosion, flora and fauna, pollution, environment restoration),
- plant genetics (grains, oleaginous crops),
- tree growing (olives, almonds),
- zootechnology,
- runs and pastures,
- exploitation economics (farming system),
- biotechnologies.

Abbreviations

- INRA : National Agricultural Research Institute
- IAV: Hassan II Agricultural & Veterinary Institute
- ENA : National School of Agriculture
- SASMA : Moroccan Agricultural Service Company
- SOGETA : Farmlands Management Company
- SNDE : National Livestock Development Company
- OCE : Office of Marketing and Exportation
- ORMVA : Regional Office of Agricultural Development
- CRRA: Regional Center for Agricultural Research
- SEMVA: Experimental Station for Agricult. Development
- CT: Works Center

Annex : Human and financial resources of the public sector(1985)

Institution	Research years	Technicians	Administrators	Permanent workers	Operating budget million DH (1)	
					Personnel	Inputs
INRA	228	467	332	1 203	77	35
IAV	175	131	247	50	20	7
ENA	15	6	3	200	3.6	0.37
Development bodies	34	49	-	33	4	3.12
Central offices	42	15	23	103	4.73	1.31
State companies	6	9	-	-	0.67	1.05
SASMA (Service companies)	3	4	-	-	0.40	1
Quality control and exports office	3	1	-	-	0.29	0.50
Totals	512	681	605	1,589	100.69	52.35

(1) More than DH 40 million in the equipment budget