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The Advanced Agronomic Training System in Morocco

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Since independence in 1956, Moroccan students have followed general or specialized agronomic studies in over 29 schools in nine different countries.

This has several serious disadvantages:

- the uprooting of students during their studies;

- the preparation of future professionals in a biophysical, economic and human environment radically different from the one in which they are to perform their duties. They thus approach Moroccan agriculture in near ignorance of its specific character and problems;

- the extreme diversity of such training. While pluralism in training is useful for research activities and interesting for the private sector, it is inconvenient for a young and independent country which needs to build a strong administration and initiate development programs.

Certain measures were taken in 1962 to help institute the progressive training of all professionals destined to work in Moroccan agriculture:

- in 1962, the Moulay Youssef Lycée started a preparatory class for the French national advanced schools of agronomy, the National Advanced School of Food and Agricultural Industries in Massy, Douai, and the National School of Horticulture in Versailles;

- in 1963, His Majesty HASSAN II announced in the Speech from the Throne the future creation of a National Agronomy Institute;

"We notably plan the creation in 1964 of a National Agronomy Institute, dealing with specific branches of Mediterranean agriculture, to be able to provide Moroccan and foreign students with a diploma equivalent to the European qualification of agricultural engineer";

- in 1966, the HASSAN II Agronomy Institute of Rabat was opened and the preparatory classes of the Moulay Youssef Lycée were incorporated as a first instruction cycle in connection with the Faculty of Sciences;

- in 1968, the National Forestry School of Engineers in Salé (Decree of 16 Joumada I 1390 - 20 July 1970) was opened, recruiting second year students from the Meknès National School of Agriculture for two years of studies.

A national system of advanced agronomic education was thus constituted to meet the essential needs of the country.

Nevertheless, officials still considered that certain forms of training were either too dependent on foreign countries or not in use (rural construction, topography, etc.) and that a multiplication of independent and autonomous educational establishments could create many problems. This led to:

- the integration of veterinary training at the HASSAN II Agronomy Institute where henceforth both agricultural engineers and veterinarians are to be trained;

- the creation of a training program for rural construction engineers and topographers (applied engineering) at the HASSAN II Agronomy Institute;

- the establishment of a first year of studies common to all institutions preparing agricultural professionals at the engineers level; and

- the creation of the Agadir Horticultural Complex.

As for technical education, the civil service reform of 1967 which established a specific status, an interministerial body of engineers and technical agents from public administrations, allowed a standardization of duties and functions for the different levels of technical professionals.

As a result, schools of applied agriculture dating from the protectorate or independence in 1956 have been organized as training schools for technical agents.

I - Different types of advanced training

1. Levels of training

1.1. Doctor of Science in Agronomy

a) Institution:

The HASSAN II Agronomy and Veterinarian Institute of RABAT.

b) Diplomas: Doctor of Science in Agronomy,

c) Length of studies: two years of advanced studies; three to four years of research,

d) Admission requirements: agricultural engineer or veterinarian; two years experience in an educational, research or development department.

1.2. State Engineer and Veterinarian Doctor

a) Institution:

The HASSAN II Agronomy and Veterinarian Institute of RABAT.

b) Diplomas: Agricultural Engineer. Veterinary Doctor.

c) Length of studies:

- State engineer: six years in three cycles

- Veterinary doctor: six years plus a doctoral thesis

d) Admission requirements: Scientific Baccalauréat, entrance examination, and preparatory year for Advanced Studies in Agriculture (A.P.E.S.A.).

e) Civil service level :11

1.3. Applied Engineers

a) Institution: the HASSAN II Agronomy and Veterinarian Institute of RABAT.

b)Diplomas :

Applied Engineer of the Institute.

c) Options:

- Food technology

- Rural construction

- Topography

- Agricultural mechanization
(offered at Rabat) and

- Horticulture

- Phytiatry

- Open space development

- Halieutics (aquatic production)
(offered at the Agadir Horticultural Complex).

Meknès National School of Agriculture

a) Diplomas:

Applied Engineer of the Meknès National School of Agriculture.

b) Options:

- Techniques and development

- Breeding

Salé National School of Forestry for Engineers

a) Diplomas:

Forestry Engineer

b) Length of studies: four years.

c) Admission requirements:

Scientific Baccalaureat, entrance examination, and preparatory year for Advanced Studies in Agriculture (A.P.E.S.A.).

Civil service level: 10

1.4. Senior Technicians

Food Technology Section and the Agadir Horticultural Complex of the HASSAN II Agronomy and Veterinarian Institute of RABAT.

a) Diplomas:

Senior Technician in:

- Laboratory techniques ; Chemistry or Biology
- Horticulture

b) Length of studies: two years

c) Admission requirements: Scientific Baccalaureat and entrance examination

d) Civil service level: 8

1.5. Assistant Realty Controllers

Training Center for Assistant Realty Controllers

a) Diplomas:

Assistant Realty Controller

b) Length of studies: two years

c) Admission requirements: Literary baccalaureat and entrance examination

d) Civil service level : 8

2. Number of diplomas per year

The current capacity of the training system is as follows:

Agronomists: 100/year

Veterinarians: 50/year

Applied Engineers: 320/year

HASSAN II Agronomy and Veterinarian Institute

Food technology: 40

Rural construction: 40

Topography: 40

Agricultural mechanization: 15

Horticulture: 25

Phytiatry: 20

Open space development: 5

Halieutics: 15

Meknès National School of Agriculture

Techniques and Development: 60

Breeding: 40

Salé National School of Forestry Engineers

Forestry: 20

Technical assistants

The training of technical assistants starts from the scientific baccalaureat level with two years in the following schools which each have a capacity of 60 students per year.

Institutions:

- Xavier Bernard School of Agriculture of Ellouizia

- Souihla School of Agriculture - Marrakech

- Zraib School of Agriculture - Berkane

- Ben Ahmed School of Agriculture - Chouia

- Tiflet School of Agriculture

- Sahel School of Agriculture - Boutahar

- Meknès School of Horticulture

- Meknès School of Agricultural Engineering and Topography

- Sidi Bouknadel School of Agricultural Mechanization

- Fouarat Royal School of Breeding - Kénitra

- Salé Royal School of Forestry

II - The aims of training

1. Relative number of various openings

Ministry of Agriculture: 14 %

District Headquarters of Agriculture: 14 %

Regional Offices for Agricultural Development: 18 %

State-owned company: 2 %

Other ministries: 4 %

Private sector: 8 %

Other offices: 3.5 %

Laboratories : 2 %

Agronomic education and research: 19 %

Other: 1.5 %

(Taken from: **1984 Survey on Professional Career Profiles of Graduates from the Institute**)

Contemporary Moroccan agriculture is faced with a double challenge: the country's food deficit and the disparity of income, regionally as well as socially. At the begining of 1980, the agricultural sector accounted for only 15% of the GNP instead of 30.9% in 1970 or 32.3% in 1960. Agricultural exports have decreased by 3% per year whereas food imports increased by 17% per year. Since 1974 the value of agricultural exports no longer covers that of food imports.

Even though agricultural income has generally increased in irrigated areas and favourable 'bour' zones, it has decreaced in other mountainous, forest or arid regions, that are more difficult to develop.

The disparity of income is also increasing as the spread of innovations over 1,700,000 farms remains very slow and fragmentary.

The current ratio of supervision is one technician for 500 farms for the 'bour' zone, and one technician for 100 in the irrigated areas. An improvement of the productivity level cannot be expected with such low figures.

There are only a few engineers in the work centers who constitute, along with the regional Offices for

Agricultural Development, the administrative unit for the supervision of seven million hectares of cultivable land.

There are no engineers in the rural communes, the first level of organization for the population becoming more and more the basis for development projects. There are few engineers in the production sector (farming, breeding), in the supplies sector (fertilizers, machines, phytosanitary products), the processing and commercialization sector (marketing, agro-industrial transformation). Out of 1,500 graduates, only 8% work in the private sector.

The need for professionals is still great for technical management, for offices and regions but there are almost no budgets for such posts. The private sector also needs professionals but has no immediate reason to employ them.

It is true that anyone can sell practically any phytosanitary product on rural markets and even in towns, given the lack of control. Why then pay specialists to prepare the product and yet another to check that it contains the required quantities? All that work for nothing!

The problem is not an over-abundance of professionals in the agricultural sector but of their use and organization in this sector's activities.

2. Programs

2.1. Main priorities

An engineer must be able to understand, explain and master the complex reality of agriculture and the society in which he must work, and at the same time, be able to undertake the actions needed to contribute towards the transformation and development of this reality.

During his training period, the student will be able to acquire these skills only if he is in serious, close contact with the national reality and if he learns to observe and to study it in a strictly scientific manner, thus preparing himself for the future duties of his profession.

This contact can essentially be made only through training courses in the field. It is only then that the student can begin to understand the real world that he will be confronted with.

Rigorous and scientific study can only be carried out through an introduction to experimental methods and a familiarization with hypothetical deductive reasoning.

2.2. Generalized or specialized training?

The current system has been criticized primarily for the gap between the training itself and the concrete needs of the profession. Such training is far too general and theoretical.

The debate between generalists and specialists began with the creation of the Institute.

At one level, an internal consensus has been reached: given the real state of the technical division of work in the country on the one hand, and the restricted possibilities available to the administration for assigning engineers to the special tasks for which they were trained on the other hand, it seems for the moment preferable to train generalists, capable of adapting themselves to various situations both in space and in time. The choice is a difficult one that goes against both the students' desires for the security that comes with technical skills and the industry's desires for well-trained professionals.

But given the present situation of the country, it is the only realistic choice.

In any event, specialized training has already been introduced within the Institute. Many branches now exist: agronomy, veterinary, rural construction, topography, agricultural mechanization, food technology, horticulture, phytiatry, open space development, halieutics, etc. Each branch also has many new options. For example, the agronomy branch includes agricultural engineering, forestry, zootechnology, environment, management, development, etc.

The necessity of preparing a third cycle thesis also leads students to work a whole year on a very specialized subject.

The natural tendency of students and the teaching body is to move slowly towards the creation of sub-options and pre-options. The present risk for the training system is thus not so much a lack of specialization but rather too rapid specialization

given the conditions of integration into the working world.

The second cause for inadaptation would be the insufficiently practical character of the training.

According to some employers, newly graduated engineers from the Institute are not really operational.

There is a general response to this criticism. Users are never satisfied with school trained professionals regardless of the school they graduate from. They always find, and rightly so, that engineers still have a lot to learn after finishing school, that they do not yet know their "trade".

2.3. Basic disciplines

The nature of agronomic and veterinary studies, primarily based on exact sciences and biology, makes it necessary to recruit for this training only persons with a solid knowledge of basic scientific disciplines.

The first two year cycle during which this basic instruction is given makes it possible to achieve three objectives:

- to ensure the transition between secondary schooling and higher education, thereby achieving progressive adaptation of students;

- to provide a basic scientific training (mathematics, physics, chemistry, geology, biology) and an initiation to social sciences;

- to enlighten students on the nature of their calling and aptitude in order to make a better choice for their future training. Basic disciplines do not play the same role in all of the programs offered. For example, chemistry does not have the same importance for the engineer studying food technology as for the engineer studying agricultural mechanization.

2.4. Teaching methods

Agronomic training, for example, includes elements from basic sciences, from environmental sciences, hydraulic and equipment sciences, plant production and animal production, social sciences as well as apprenticeship courses.

These elements make it possible to give in the form of courses, supervised or applied workshops, excursions, visits, and seminars, the instruction of related subjects with the aim of improving knowledge, analysis and understanding of the concerned field.

Instruction takes place with equal attention to the importance and value of each element, but with a chronological and logical sequence of the different subjects. For example, basic genetics and animal physiology are taught before genetic improvement of animals or animal nutrition.

Other subjects are programmed according to their necessity and their use for a given training period.

The academic year is divided into trimesters and includes the following pedagogical periods:

a) an instruction period and preparation for the apprenticeship which mainly takes place at the Institute (40 days).

b) an apprenticeship in the field (15 days).

c) A period after the apprenticeship during which the work and observations made in the field are used, as the instruction continues (15 days).

d) a session of examinations pertaining to all subjects taught and completed during the semester (10 days).

e) a holiday period at the end of the semester allowing students to rest.

Apart from the apprenticeships, all the training programs of the various branches of studies include personal work for students in their last year: 4th year for applied engineers; 6th year for state enginers or veterinarians.

This personal work involves both bibliographical and experimental research with some investigation. It also helps to mobilize the departments of the Institute and intensifies research activities and development studies.

The choice of subjects is suggested by the instructors who are in contact with outside agencies (agronomic research, technical

departments, offices, development organizations), interested in investigation and research work.

2.5. Continuing education

The objective of training is reorientation, improvement or adaptation of agricultural professionals and technicians to maintain their technical competence and dynamic.

Reorientation allows one to update aptitudes and knowledge made necessary by scientific and technical development and to improve skills in a given field which was treated too theoretically or specifically during an initial training course.

The first continuing education activities consisted of a certain number of training courses and seminars at a national level, representing a real interest for Moroccan agriculture but not meeting the explicit needs formulated by future participants.

A new approach has since been applied: that of "Research-Action". In other words, the actions based on theoretical reference data and an ability of adjusting to concrete situations have been evaluated and this evaluation has always been taken into account for programming new actions.

Knowledge of training needs represents one of the difficulties for continuing education training, at both the theoretical and practical levels. Based on a consultation with a number of agricultural officials, a number of continuing education activities were submitted for those fields considered as being deficient. Activities at both the national and regional levels could thereby be organized.

The length of training courses was set according to a compromise between the administratively tolerable absence from one's job and pedagogical efficiency.

Short repetitive sessions have the advantage of allowing the assimilation of new knowledge as well as time for personal work or field observations during the periods in between.

Training sessions at the national level enable the limited number of high level specialists to meet to analyse and express their needs (as they are used to doing). This type of training also allows the limited number of professional groups with a common work profile to get together, for example, forestry engineers in charge of soil conservation and restoration.

To these sessions can be added:

- the participation of professionals and technicians in seminars organized for 6th year students of the HASSAN II Agronomy and Veterinarian Institute.

- the participation in information sessions organized by national associations of instructors, researchers, technicians and professionals.

These associations, which are part of a Federation of National Associations for Rural Development (*Fédération des Associations Nationales pour le Développement Rural - FANDER*), are the following:

- National Association for Land Improvement of Irrigation and Draining (*Association Nationale des Améliorations Foncières des Irrigations et du Drainage - ANAFID*).

- National Association for Animal Production (*Association Nationale pour les Productions Animales - ANPA*)

- National Association for Improvement, Production and Protection of Plants (*Association Nationale pour l'Amélioration, la Production et la Protection des Végétaux - ANAPPAV*)

- Moroccan Association of Soil Sciences (*Association Marocaine des Sciences du Sol - AMSOL*)

These associations organize seminars, conferences and study tours during which ideas and experiments are compared, and research undertaken in the concerned fields is described.

REGIONAL LEVEL

The instructors are professionals and technicians of the region's agricultural departments, organizations and companies. They are not full-time instructors for adults but are called in as trained specialists or pedagogical organizers.

Depending on the subject, national specialists participate in the organization of regional training courses. For example, teachers in arboriculture of the Institute participate in the course on olive trees in the Marrakech region.

The Institute for Agricultural Education of the region is in charge of the administrative and material organization of activities in connection with the Continuing Education Department, and it is slowly taking over the pedagogical aspects.

This regionalization of continuing education has mainly developed in Marrakech around Souihla and in Agadir around the Horticultural Complex of the Institute.

Continuing education, to which can be added the activities of the pedagogical and administrative organization of Training Schools for Technical Assistants through work on training programs, various surveys, pedagogical grouping and organization of socio-cultural events, has involved up to 700 participants in 30 sessions representing 2,100 days of training.

More and more often, requests for continuing education are formulated in a precise manner, allowing for efficient and well structured actions. Nevertheless, one must not forget that it is only because of the cooperation of training institutions who organized the training courses. This is the case for the specialized subjects of the Marrakech Souihla School, the Casablanca Ellouizia School, the Meknès Horticultural School, the Agricultural Mechanization School, the Breeding School and the Agricultural Engineering School.

The Institute's departments serve as support for the organization, progress and supervision of these training courses through the supply of instructors and the provision of its research results.

PEDAGOGICAL EVALUATION

Pedagogical evaluation is considered essential and must be permanent in order to ensure and maintain the quality of training which, from the start, has been aimed at the highest international levels.

This objective was set as early as 1963 by His Majesty HASSAN II in the Speech from the Throne: "We notably plan the creation in 1964 of a National Agronomy Institute, dealing with specific branches of Mediterranean agriculture, to be able to provide Moroccan and foreign students, with a diploma equivalent to the European qualification of agricultural engineers".

Moreover, the evolution towards an integrated system of professional level training for development requires a regular revision, during the preparation of the five-year plans for economic and social development of Morocco, in order to obtain a better balance between training needs and resources.

In 1970-1972, in 1974, in 1977-1978 and 1980-1984, the "Training, Research and Extension" committee of the main Agriculture and Dams Commission worked on the plan. This commission included instructors, public and private users, who have made surveys on needs and have suggested training branches, periods and accompanying measures, etc.

Internally, two types of evaluations contribute towards the pedagogical debate:

a) continuous and permanent evaluation at the teaching staff level, including the contribution of the hundred or so visiting professors who annually bring a new outlook on education, comparing the level of the Institute's students with that of their European and American counterpants, discussing with their colleagues from the Institute and sharing pedagogical experiences.

b) pedagogical considerations that periodically sum up the situation and give a critical view of pedagogical activity on the whole.

The pedagogical File in 1971, initiated by the Human Sciences Department, permitted the official insertion of pedagogy in the training courses offered at the Institute.

The pedagogical days in June 1978 were the first important forum during which 250 teachers-researchers agreed to reduce by 10-20% the volume of academic education in order to favour more personal work by the students.

The 1985 reform introduced an initial period of practical work in agricultural farming prior to any instruction and envisaged a global pedagogical restructuration of training programs and institutions.

Finally, the practice of evaluations by high level professional teams has allowed precise diagnoses and a definition of evolutionary directions and operating difficulties.

III - Organization

1. Institutions

Since October 1969, governmental authorities, relying on intellectual and economic criteria, have expressed the desire of seeing advanced training such as veterinary medecine, topography, rural construction, food technology and agricultural mechanization entrusted to the HASSAN II Agronomy and Veterinarian Institute.

In 1980, the second campus of the Agadir Institute was opened, constituting a training complex in horticulture, phytiatry, open space development and halieutics.

The Institute thereby combines in one organization many different training programs. This relative concentration could have led to the institution being considered too big and too centralized.

This structure does create tensions: some schools have felt restrained by a general analysis, whereas they would have preferred a more specific orientation; others have had the feeling of not being allocated their fair share of human and material resources. It is absolutely certain that a break-up of the complex into independent units would inevitably lead to an impoverishment and a weakening of each one. It is hardly necessary to list the obvious advantages of the training system:

- economy of scale: a single group of human and material means, conceived for high level training, could be used for various training programs;

- unity: a guarantee of the national (and not just local) value of diplomas issued. This guarantee is maintained by conditions of common access, by the common program core, and by a consensus within the teaching body on minimum requirements for training;

- the possibility of all schools integrated in the complex to benefit from all or part of the practical training seminars, considered in the country and at the international level as a unique experience in learning by doing;

- providing any national or foreign organization needing studies or research an interlocutor with a vast reserve of competence in various fields and an experience of over a decade of field studies;

- offering exceptionally favourable conditions for multidisciplinary work, bringing together for meetings on a same theme agronomists, hydraulic engineers, dieticians, foresters, topographers, veterinarians, economists, sociologists, geographers, etc.; and

- grouping in a single place many young people following various but related training, helping future professionals to learn to live together, since they will have to collaborate once they start to earn their living.

Tutelage should be shared by the national authorities globally in charge of the missions entrusted to the institution:

- the academic mission of training is dependent on the governmental authority in charge of education or training of professionals;

- the agronomic mission is dependent on the Ministry of Agriculture and of Land Reform; and

- the budgetary implication of these missions is dependent on available funds.

Although necessary, such tutelage must not be a burden. It should allow a flexibility of operation for the institution in a general framework of defined orientations and precise objectives. A board of directors responsible for such "tutelage" ensures the supervision of the institution.

2. Programs

The orientation and content of the programs, of which certain aspects have been described in the

preceding chapter on pedagogical evaluation, are defined at different levels:

- the general mission of the institution, described in legislative and statutory documents, defines the training levels, conditions for admission, length of training and types of diplomas; and

- an advisory council gives its opinion on the education provided and suggests reforms for improvement.

With the help of contacts maintained with specialized organizations or engineers, this council must notably suggest measures which can help to make education more suitable to the needs of the country.

It is composed of: representatives of the tutelage and user administrations (agriculture, education), representatives of training institutions (faculties, other schools of engineers; research institutes), representatives of teachers-researchers, and representatives of employer sectors.

Specialized committees, national seminars, and other opportunities allow an orientation of programs according to needs and realities in the field.

Over the past few years, academic education at the Institute has generally progressed without really challenging the exaggerated importance of traditional lecture courses. The Institute is far from having a monopoly on overloaded and traditional education. This type of education is unfortunately still quite prevalent, including in many institutions for advanced agronomic and veterinary education in developed countries, some of whom cooperate with the Institute.

Moreover, even with its modest attempts at pedagogical renovation, the quality and efforts of teachers makes the academic education of the Institute still superior to education provided in many similar institutions in industrialized countries and the Third World. The existence of 70 scientific subjects should be noted as well as the important development of some of them.

Pedagogical innovation must take into account:

- the quality of students who have always been used to a strongly directed from of education and who must progressively adapt to an education giving more leeway to initiative and personal work; and

- the evolution of the teaching body itself, also under training, which will progressively mature with a larger experience and a greater availability.

3. Organization of research in training institutions

3.1. Objectives

Apart from apprenticeships, all training programs for the various programs include personal work from students in their final year: six to ten months for applied engineers in their fourth year, ten to 16 months for state engineers or veterinarian doctors in their sixth year.

The country's need for teachers in higher education and for researchers makes it necessary for a certain number of agronomists and veterinarians to undertake high level studies in an advanced specialization of the agronomic field leading to a doctorate in agronomy.

Personal work includes bibliographical research, experimental research and field surveys.

The Institute departments must thereby organize every year 25 doctoral theses in agronomy, 150 third cycle and veterinarian doctoral theses, as well as 320 final reports and projects. This implies:

- the definition of the subject in one or several of the 70 scientific disciplines available at the Institute;

- the establishment of a work schedule with its bibliographical, experimental or field data gathering stages; and

- the writing and defence of a thesis within the deadlines.

The choice of subjects is suggested by the instructors who are in contact with outside agencies such as agronomic research stations, technical departments of the Ministry of Agriculture, regional Offices for Agricultural Development, agricultural or agro-industrial

companies, etc. who are generally interested in investigation or research work on specific subjects.

Among the more valued research work carried out in the Institute is that which is applied to various aspects of regional development, thus expressing the wish of teachers and students to understand and confront the concrete problems of specific agricultural environments.

The complexity of agricultural and rural realities calls for more and more pluridisciplinary collaboration, associating various departments in order to obtain "feasible" development plans.

3.2. Financing of research

Research related to studies is financed by the general budget for education: facilities for scientific work such as laboratories, experimental land and herds, documentation, communication and travel, as well as equipment for calculations, are made available to students who are doing research work.

Even though these means are considerable, they are nonetheless insufficient. Thus the necessity of other financing sources generally obtained by contracts or research agreements with:

- the technical departments of the Ministry of Agriculture and of Land Reform (Breeding Management, Plant Production Management or Provincial Management of Agriculture) who sign three year contracts for surveys, for a technical study or for a development project involving a group of researchers in various subjects who can use students for some of the work;

- semi-public or private organizations (national or foreign) interested in a particular technical problem (development office, seed company, etc.);

- research centers or national or foreign institutions or universities within an agreement for associated research (CNRS, INRA, University of California, CRSP, etc.);

- international organizations in the form of contracts (EEC, UNESCO, FAO, ISF).

The research themes and the financing plans are negotiated and established by common agreement with reciprocal participation and contributions.

3.3. In Morocco there is a special body of teachers-researchers for university and other higher education institutions, who had a more privileged status than that of engineers in the civil service until 1986 when the reform of the engineers' status reversed the situation.

The National Institute of Agronomic Research has had a special status since 1984 but the reform of the engineers' status has made it less favorable. A more general status for researchers is still being studied and discussion on a special body of researchers remains open.

3.4. Education in agronomy cannot be separated from research in development. The aims of development, perceived through problems faced by our agriculture, must be reflected in our research programs, and should be the principal factor in the definition of the content of our courses.

At the Institute, the Training-Research-Development trilogy is already firmly rooted. Attention is now focussed on increasing collaboration with other research institutions and extension programs in order to increase:

1. the participation of teachers-researchers and extension workers in the INRA scientific committees on the one hand, and of researchers and extension workers in the juries for theses, papers and assistantships in schools on the other hand;

2. the participation of researchers and extension workers in the pedagogical activities of schools;

3. the definition of the annual needs and qualifications that these institutions are expected to satisfy;

4. the definition, in a concerted way, of subjects for papers and theses of students, teachers and researchers;

5. the joint supervision of theses and papers by scientists from various educational, research and extension institutions; and

6. a concerted choice of the most adequate structures for training the scientific and technical staff of the various institutions.

The existence of a "Training Research and Extension" committee within the Agricultural and Dams Commission for the economic and social development plan already represents a level of coordination between the institutions in charge of educational and research activities.

The reciprocal participation in the board of directors offers an annual form of coordination and the existence of a cooperation agreement between the two institutions provides a precise framework for collaboration.

More than this institutional framework, the quality of human, individual or group relationships between teachers-researchers and researchers constitutes the dynamic element of this collaboration. The fact of having been trained in the same institution, without excluding competition and rivalry, allows a comprehensive approach to scientific work undertaken in common.

4. Teaching staff

4.1. Numbers

Permanent teachers: 310

Teachers under contract (two years renewable): 50

Visiting teachers: 120

Permanent teachers are nationals or foreigners living permanently in Morocco. They are integrated into the teachers-researchers body of higher education institutions.

Teachers under contract are generally foreigners working under common law or through bilateral or multilateral cooperation programs. Even though the contracts are generally for two years, the length of residence can be over 15 years, and generally lasts an average of four to five years.

Visiting teachers coming regularly from institutions cooperating with the Institute give courses on a free-lance basis. They participate in the supervision of national teachers as part of the "training of instructors" and also engage in scientific activities such as seminars, defence of theses, etc.

On the whole, visiting professors ensure the follow-up and the permanent evaluation of pedagogical and scientific activities.

4.2. The status of permanent teachers mentioned above puts all teachers-researchers in the same situation whatever institution, faculty or school they come from. The comparison with the main bodies of the Civil Service varies periodically without definitively giving an advantage to either.

The age of retirement, set for all Civil Service functions at 60 years old, is not a current problem for this overall young teaching body.

4.3. Training and recruitment procedure

The main source of recruitment for the assistant-lecturer level is the best agronomy or veterinarian graduates with the best aptitudes.

These assistant-lecturer trainees follow an initial period of at least two years in the departments concerned where they take part in both pedagogical and research activities. They thus participate in classroom instruction, in the supervision of training courses and in helping students with their papers.During this period, they benefit from the scientific and pedagogical supervision of older permanent teachers and visiting professors.

At the end of the initial period described above, which allows a familiarization with the department's activities and problems, the young assistant-lecturer starts his advanced scientific and pedagogical training for a period of two to three years within the framework of various agreements between the Institute and similar training or research institutions in Europe or in North America. The time spent in a foreign faculty or department allows him to follow an extensive education in his specialization, to start his bibliographic and laboratory activities in preparation for his research leading towards the attainment of the Institute's doctorate in agronomy.

After this second period, the young teacher is ready, for example, for the preliminary examinations of a Ph.D. in American universities.

Back in his department, the assistant-lecturer, in addition to pedagogical and supervisory activities, starts his actual research which will last between two and four years according to the scientific discipline and the chosen subject. During this period, he benefits from the scientific supervision given by his thesis director and by other visiting professors who discuss the progress of his work.

Once the research work is finished and written up, it is submitted for the approval of a qualified international jury, including the best specialists in the field. The jury confers the title of Doctor of Science in Agronomy of the HASSAN II Agronomy and Veterinarian Institute, which allows him to have the rank of lecturer according to existing regulations.

This formula has the double advantage of maintaining the link between the student and the pedagogical activities of the institution during the whole training period and of achieving research work on a subject of national interest, while remaining in contact with the international scientific community.

The opportunity given to young Moroccan scientists of publishing with their foreign supervisors in a specialized journal is a contribution towards the advancement of Moroccan scientific research at the international level.

Professors are recruited among lecturers having practiced as such for at least four years.

A proposition of promotion to the level of professor is submitted to the Coordination Council of executive training institutions, which guarantees the legal character of the procedure and registers the nomination that becomes effective only if a budgetary post exists.

5. Students

The variety of training makes it necessary from the beginning to assign recruited high school graduates to a given institution. In other words, this determines their academic orientation - extended training (six years) or specialized training (four years) - as well as their professional orientation (agronomy, veterinary medecine, rural construction, topography food technology, forestry, agricultural works) with a double uncertainty:

- for institution directors and professors who have difficulties in detecting a student's capabilities through his high school grades and results; and

- for students who, because of a lack of sufficient information and advice, rarely know their own aspirations and aptitudes.

A student can thereby fail or not feel at ease in the program to which he was assigned although he could have succeeded and thrived in another program.

Transfers cope only partly with this difficulty.

The result is that each institution has proceeded with its own elimination process and this loss was prejudicial to the country's economy and to the success of individuals. The Institute and the Meknès National School of Agriculture, for example, recruited scientific high school graduates under 23 years old but only kept 40% of them after the first year. The remaining 60% were reoriented in other fields of training outside agriculture.

A periodic study of needs for professionals specifies, for the duration of each national Economic and Social Development Plan, the number of different specialists and technicians required for implementing the programs approved for agricultural development. This is how, after detailed surveys, the number of students for each year in each training branch is determined.

At the end of their preparatory year for advanced studies in agriculture (PYASA), students having passed the required examinations choose the training they wish to follow, in order of preference, from the wide range of training programs available).

A regulation entitled : "Knowledge and Aptitude Test - Evaluation of results", is given to students at the beginning of the year. This describes in detail the method used for evaluating and guiding students in each program of training in agriculture, considering results achieved, aptitudes revealed and tastes expressed.

All the basic subjects taught during the PYASA do not have the same importance: animal biology, for example, is not given the same attention in the food technology program as in veterinary medecine. The first will thereby have a greater rating than the second, in the same way as chemistry will have a greater rating in food technology than in agricultural mechanization.

Each training program thus has its own specific rating pattern.

Students are classified each time according to merit, following the rating pattern of each training program.

Given the number of openings in each program, the student's choice is taken into consideration according to merit.

With this method, the student's wish is adjusted to aptitude in the chosen field and thereby 80% of the 600 students in the PYASA are admitted and can profitably follow one of the available training programs. The remaining 20% are reoriented towards agricultural studies.

Finally, a possibility of access to engineering studies is provided for agricultural technicians in their specialization, after having obtained the scientific baccalaureat and passed the PYASA level examination in the appropriate program.

6. Cost of studies

By including real estate investments and equipment costs spread over 30 years, ten years and five years, and the annual operation budget covering wages, the annual average costs per student are:

22,225 DH/year for the Institute

25,953 DH/year for the Meknès National School of Agriculture

24,310 DH/year for the Sahel Boutahar School of Technical Assistants.

These figures show the importance of the economy of scale achieved by the Institute in comparison with a smaller sized institution - the N.S.A. (300 students) or even with a school for technicians (150 pupils).

Besides the hypothetical revenue from experimental farms or services to third parties, most of the overall cost is covered by a State subsidy.

Students with a State scholarship only use a quarter of their grant for boarding, which is also subsidized.

Private institutions and international organizations participate only through contracts and agreements outside the budget.

IV - Main problems - Debates

Advanced agricultural education in Morocco has no problem competing with academic science education. Thanks to the activities, scientific events and quality policy of the Institute, it has quite a prestigious reputation of being a leader.

The problem of job openings is not specific. According to the economic system in place, the State is the main employer of professionals for offices or economic activities controlled by public organizations. An orientation towards more privatization creates transition problems.

The Institute provides training based on needs and development; its graduates should succeed in the private sector by taking initiative in creating companies or in helping to improve the productivity of existing ones.

Nevertheless, acknowledgment and control of quality, and the regulation of professions, are prerequisites for a successful conversion.

The Institute actively participates in an international training network for agronomy and veterinary science. The role of the Institute in the activities of the Association for African Agronomic Universities, regrouping African institutions, is a good example of this calling. Other examples follow.

The Institute participates in an international program on small ruminants in cooperation with

13 American universities led by the University of California (Davis), and three other countries, Brazil, Kenya and Indonesia. This program includes studies on all aspects (genetics, nutrition, behaviour, organization, economy, sociology) of small ruminants (sheep, goats) for better use in the diet of vast populations and for the economy of many Third World countries.

UNESCO has initiated a pluri-annual study and research program on Man and the Biosphere (MAB) which includes many themes of ecological studies. The Institute hosts the MAB Moroccan Committee.

The International Science Foundation, based in Stockholm, encourages research and gives research grants to young researchers in order to develop work on priority themes.

This foundation includes 59 countries represented by scientific institutions, and the Institute is the corresponding member for Morocco. It organized its general conference of October 1984 in Rabat, which shows the position and role of the Institute on the international scene.

The Institute participates, with the FAO, in a development program in the Mauritanian oases by putting in practice the traditional technology of draught animal draining. This operation combines actions for research training and international cooperation.

ICAMAS is thus urged to animate an international network in the Mediterranean region which is sufficiently varied at the ecological, agronomical, economical and social level for developing exchanges in the field of training and development actions in this region and to be used as a model for use in Africa and the Middle East.