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volved in statistical training should be prepared to improve their offerings quantitatively and qualitatively.

Provision of scholarships for post-graduate work at well-established statistical centres will help prepare additional staff to cope with the expected expansion in statistical offerings. Short statistics courses should be initiated at Jordanian Universities to provide school mathematics teachers with information and training which they need for effective teaching of the statistical part of the mathematics curriculum. Finally, the establishment of an exchange program between Jordanian statisticians and their colleagues in international statistical institutions and centres will be of great value in the development of statistical man-power in Jordan.

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CHAPTER 6

The Training of Statisticians in Morocco

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6.1 THE EDUCATION SYSTEM

Primary and Secondary education last 12 years and access to higher education is possible for those who successfully pass the National Examination of the 'Baccalaureat' (proportion 30%). Enrolment at the University is open to 'Bac' holders but this qualification is not enough for entering some institutions for higher learning (Engineering schools or 'Grandes Ecoles'). Indeed a special entering test is required and competition can leave no more than one percent chance of succeeding. The field of statistics is among those which require such entering tests.

At the University level, training lasts 4 years for a B.S degree or 'Ingenieur d'Application' and 2 additional years for an M.S degree or 'Ingénieur d'Etat'. There is a two year program leading to a college degree called 'Adjoint Technique' but holding the baccalaureat is not necessary for this shorter route.

The language of instruction is Arabic at the primary and part of the secondary level (by 1990 the baccalaureat will be in Arabic) but at the University level the teaching is done mainly in French in the scientific and technical branches. There are a few exceptions since statistics is also taught in Arabic in a section parallel to the French one (at the National Institute of Statistics and Applied Economics).

Education is essentially free throughout the education system. There are even scholarships paid to University students. Professional and vocational education is also available at an early stage (at the end of elementary or pre-high schools).

6.2 STATISTICS AT AN ELEMENTARY LEVEL

By the age of 16 or 17, students have had enough algebra and other mathematical tools to be introduced to ideas of probability and statistics. Some high school text-books give statements and formulae that are sometimes a little advanced for a high school student. Generally combinatorics and descriptive statistics are well covered in the classroom at a first level. Probability concepts are the most difficult to become comfortable with at this level.

6.3 GOVERNMENT STATISTICIANS

Most Government statisticians in Morocco are trained at the National Institute of Statistics and Applied Economics (INSEA), with a few exceptions trained abroad (essentially in Paris at ENSAE or CESD). INSEA was created in 1961 to receive Moroccan and other African students. So far more than 1200 degrees have been awarded with 25% going to foreign students (mainly Tunisians, Camerooneses, Tchadiens, Maliens, etc...).

At the start, assistance was provided by the United Nations but by 1973 the Moroccan Government took over the administrative and financial needs of INSEA.

Three levels coexist in the school: College, B.S and M.S which require respectively 2, 4 and 6 years of higher learning. In addition, a 3 years professional activity is required after the B.S degree before continuing on the M.S degree. This last requirement has the advantage of letting the student have a taste for practical problems before being exposed to further theory. A master's thesis is an occasion to demonstrate research skills and usually takes one or two semesters more than expected. This means that 9 to 10 years are required after the 'baccalaureat' before the M.S degree is actually obtained.

It is worth mentioning that INSEA has a full program in Computer Science which has a positive influence on the training of statisticians.

Courses are taught by Moroccan University professors holding Ph.D degrees from Canada, the United States of America, France, Great Britain, etc. Some courses, by their very nature, are taught by senior statisticians working in professional practice.

In addition to Mathematics, Probability, Statistics and Economics, many other courses are given on Sociology, Demography, Management, Accounting, etc. Though the majority of graduates from INSEA work for the Government (in data gathering and economic planning) many are hired by private companies and perform a variety of jobs because of their multi-purpose training. As expected there is a lag between the theoretical tools taught at the Institute and the approach and methods used in statistical practice in Morocco. This is true in many other professional fields and many other countries; the gap between theory and practice is a worldwide phenomenon.

6.4 STATISTICIANS IN THE PRIVATE SECTOR

Not all persons practising statistics have had formal training. Simple statistical work is carried out in banks, insurance companies, industrial firms etc... by clerks who have a general education and little academic statistical knowledge. They usually draw time series and graphics, count units, calculate simple averages etc.

Sophisticated collection of data, analysis and forecasting are carried out by professional statisticians, economists or graduates of various engineering schools. Graduates of INSEA are usually put in charge of key jobs.

6.5 ACADEMIC STATISTICIANS

Professors of statistics and academic researchers in Morocco are mostly trained abroad in various universities. This situation can be explained by the fact that higher education received massive enrolments only in the past two decades. Most university graduates are young. Specialising in statistics is also a recent phenomenon so it is not surprising not to find many people writing their Ph.D thesis in statistics in Moroccan universities. However more than 40 Master's theses have been written at INSEA. Areas of specialisation close to theoretical mathematics are more common: Stochastic processes, measure theory, linear models, etc. There are however Moroccan professors who specialise in survey sampling, analysis of variance, robustness, data analysis, time series analysis, nonparametric statistics, etc.

6.6 SPECIALISED STATISTICIANS

Research in Biology, Agriculture, Psychology, etc..., makes heavy use of statistical methods. Moroccan agronomists or psychologists usually acquire the necessary tools in statistics by personal study and practice. However it is often the case that they consult with professional statisticians. There is however no formal institution for such consultations. They are usually carried out on a personal basis. Multidisciplinary research groups bring various specialists together and the necessary statistical analysis is performed within such frameworks.

6.7 PROFESSIONAL SOCIETIES

The Moroccan Association of Statisticians (AMIS) has been in existence for more than twenty years. General assemblies are held periodically and scientific and social activities are organised. Issues relevant to the profession are discussed and improvement of salaries and working conditions are among the objectives generally sought. However other issues going beyond immediate concerns are also dealt with.

AMIS is linked to the National Union of Engineers (UNI) because statisticians are regarded as 'engineers' in Morocco. It is also linked to the recently created Arab and African associations of statisticians. The link with the International Statistical Institute (ISI) is the oldest from the point of view of individual membership.