

## IMPROVEMENT OF TEACHING AND USE OF STATISTICS IN AFRICA'S SUBSAHARIAN COUNTRIES: THE EXAMPLE OF BENIN

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*Statistical science is important in a developing economy. Consequently, the teaching of statistics must meet particular and rigorous demands. But in developing countries it is not so easy to direct any of the few available resources toward the teaching of statistics. So those countries have to choose the best way to follow the evolution of statistics and to apply it efficiently, especially in the new contexts of the global economy and the development of new technologies for information and communication.*

### INTRODUCTION

It is a truth that taking political, economic or socially efficient, rational and optimal decisions needs a battery of appropriate numeric indicators or statistics. Therefore, statistics data or indicators, produced by scientific methods and their analysis are important for any decision-maker by helping him in the best choice for any viable project. But in developing countries, such as Benin, there are many domains of intervention and the priority is not automatically in the direction of sciences such as statistics. For example, there is so much to do in agriculture, which concentrates about 70-80 per cent of the populations in Africa's countries, in building roads, hospitals, houses, etc. In order to have efficient investment, the States must base their choice on scientific statistic analysis and so they must develop statistical sciences teaching. This is not easy in the global context of recession and of structural adjustment programs, of stabilisation politics and of globalisation of the economy.

Anyone can easily declare himself a statistician, econometrics specialist, or a data analyst. The lack of real statisticians leads to the poverty of scientific publications and the failure of some development projects. In addition, there is a real difficulty in executing some ordinary statistical operations such as surveys, estimations or inference. The larger part of the population is illiterate and it is not so easy to translate from French or English, the official languages, into vernacular languages. African statisticians have to find the appropriate way to improve statistics. In this way, the implosion of new technologies of information and communication, the networking, the World Wide Web, the development of computer sciences and statistical software must help to find the most appropriate solutions. Each country can also choose the option which is adapted to its case.

### 1 STATISTICIAN TRAINING IN BENIN

#### *1.1 Statistics Training in Benin from 1960 To 1980*

During this period, there were no statistics schools in Benin. Some students were sent into the schools of Yaoundé in Cameroon (especially since 1972), Abidjan (Ivory Coast) or Paris (France). In Yaoundé, Cameroon, there is a School of Demography where, after one or two years, the students can become a statistician or a demographer with the following degrees: statistics technical agents, statistics technical assistants, engineer in demography with a test access mode. The second school is the National School of Statistics and Applied Economics. The access mode is always the test and the number of applicants is limited. That is the same case for the school of Paris which is a Centre of INSEE (Institut National de la Statistique et des Etudes Economiques).

In 1979, Canada helped Benin's National University by creating the University Polytechnic College. This college is a practical science application school. Its teaching domains vary from building, roads, civil engineering, biology to statistics. The polytechnic college trained just before the creation of the National Economics Institute two classes of engineers performing statistical works. During this period, the number of statisticians was limited and their working conditions were not very interesting.

Anyone could produce data. But what kind of data and with which scientific methodology? Such interrogations are not important; the planner could become a statistician, the doctor is also statistician. At the same time the real statistician's working conditions and

environment were very poor. That was the case in the National Institute of Statistics. Its bureaux are in an old colonial house in advanced disrepair. And sometimes planners are designed to command statisticians in most important sectors of their competence requiring.

### *1.2 Statistics Teaching in Benin since 1980*

Earlier at the beginning of the eighties, the Benin Government and the authorities in charge of education understood the need for statisticians, computer technicians (specialising in management), planners, banking workers, and marketing agents. Then, they created a department of the university named Institut National d'Economie (National Economics Institute). The purpose was to promote training of statisticians with a certain background in economics and particularly in development fields.

The creation of this school did not stop the training of Benin students in the others schools of Yahoundé, Abidjan, Dakar or even Kigali. But for some years the Paris school has not been open to African students. The first years, the students were supported and taken into account by the State. That state of things has limited seriously the number of students entering the school. Each year there were between two and five. This situation changed in 1993. Students who have means supported themselves and took the courses. The result is the implosion of the number of students entering and leaving the courses each year. For example there were just two in 1992, seven in 1993 and more than 25 in 1994. The feature of this school is that it trains students of both first and second level or cycles with, respectively, the diploma of Ingénieur des travaux statistiques and Ingénieur statisticien economiste. But despite these efforts to train more and more statisticians, there are still a lot of problems that put a brake on the evolution of the profession. These problems are of two sorts: environment problems and teaching problems.

## 2 DIFFICULTIES TO PRACTICE STATISTICIAN PROFESSION

### *2.1 Difficulties in Relationship with Environment*

These difficulties concern each domain or sector of application of statistics and the legal environment, the legal context of doing statistics. In the first case, people think that the statistics profession has no specificity, no particularity. It is just the use of data. But the question remains as to how the data should be collected and with which methodology. What are the means of concepts? What is the process in order to obtain indicators? Such are some questions people who denigrate statisticians don't take care of. Then anybody who can assemble data can produce statistics. For example, in medicine, some doctors specialised in epidemiology or those who are working in patterns like endemic sickness (HIV AIDS, palladium,...) behave like statisticians. So they forget that they have been taught only some basic notions in statistics, and that they need the help and the technical assistance of statisticians in order to realise estimations.

Then, those indicators that project statistics such as birth, death, mortality, infant mortality, causes of endemic, nutrition data, are necessary to build any health policy or program. So, the success of sector-related or national health planning policies and programs based on these incomplete, deficient and defective figures are mortgaged. Researchers agreed and convinced themselves that the use of economic analysis can explain educational phenomena and help to plan the development of the sector based on its diagnosis. Since then, the production of data and indicators must follow a rigorous procedure from the collect of the data, their verification and treatment to their analysis.

### *2.2 Difficulties with Researchers and non Governmental Organisations*

Some researchers and Non Governmental Organisations are working in Benin. They conduct research studies based on small or large surveys and data analysis, works which lead to the use of data and the publication of the results in reports or in research journals. But most of them do not have the basic statistic training notions. Naturally, a cursory glance over these research journals or reports reveals that the articles or the studies or surveys results published in them are neither of basic research nor of statistical concepts and methodologies studies in the form of prospective, retrospective, experimental or inferential studies. Most of the articles based on such studies and research are written with too small samples, which are not selected statistically thus with questionable reliability. Many of those articles or publications written by

researchers or consultants or Non Governmental. It occurs that, in some operations, after clamping, they ask the help and intervention of statisticians.

### *2.3 Teaching Problems*

Statistics is a science. It has rigorous methods. But statistical methods are also evolutionary. Researchers take into account political and socio-economic context to choose their research subject. Each year there is some improvement of methods, concepts and so on. But in Benin, since the founding of the National Economics Institute where statisticians are training, the curricula have not been revised in order to follow both international and national contexts.

Then the problem of efficacy and efficiency of those professionals of statistics is a reality. It is naturally non-understandable that more than twenty years after the founding of this high school, the curricula are still the same without any small change. At the same time, the teachers are not really adequately qualified to teach statistics, econometrics or some statistics specific branches. Then they cannot maintain their level or they regress totally and the students' training receives a blow. The situation is more deplorable in other public or private vocational schools, particularly in the innumerable private schools, which push in the country since the era of democratic renewal. In those schools, the curricula must also be revised.

## 3 IMPROVE TRAINING AND USE OF STATISTICS

The use of statistics must be improved. The statisticians must have best working conditions even if in Benin, some efforts are made to change the legal working context.

### *3.1 The Creation of National Statistic Council and the Rule of National Statistic Institute*

In 1972, the popular Republic of Benin took an ordinance creating the National Statistics Council. Its mission was to promote the statistical activity and the socio-economic information and to centralise them at the State level. The Council did not work really because of the political environment. But since 1994, with the era of democracy, the Council has been reactivated. This dynamism permits the Parliament to vote the new law of the Council in January 1999. The law which actualises the ordinance of 1972, recognises a great rule of co-ordination of the national statistics system to the National Statistics Institute. Then, this institute has to train the statisticians of current and executing works.

Since 1994, six classes of students have been trained for the Statistic Technique Agents degree. The advantage of this vocational training is that the courses are given by professionals who are in contact with statistical work and uses of statistics. In other hand, since the beginning of the nineties, the United Nations Economic Commission for Africa instituted the African Statistics Day (November, 18). So each year there are some actions realised in order to develop a statistical culture in Benin and to get people, economists, researchers, politicians, to understand more about the use of statistics.

In June 2001, the statisticians created their Association named Beninese Association of Statisticians and Demographers in order to solve the problems in relationship with the profession. In which national operations statisticians must intervene? How to organise solidarity between them? How to improve the teaching of statistics in Benin? Of course this association will be very helpful to the profession of statistician in Benin.

### *3.2 Training Statistics Basic Notions in Specific Domains which Require Statistic Intervention*

Each year, the Government organises a special training session for the workers in a specific domain on statistical methods, and collection of current statistics. There are some special sessions in domains such as financial, custom sectors, management and banking. There are also structural capabilities reinforcement programs with the help of international institutes: United Nations Development Program, World Bank, International Monetary Fund. Sessions are also attended on data processing and basic softwares.

### *3.3 Revising of Curricula in Statistic Schools*

It is a fact that nowadays, the curricula in statistics training are not adapted to such global and local environments. Then the school authorities have to take into account the curricula in

others similar schools in Africa as well as elsewhere in the world. They must take care of the selection of the teachers. Those ones have to master the content of their courses.

The schools must develop research journals and scientifically published ones. The development of the technologies of information and communication must be used as well as possible. With the World Wide Web, students, teachers, and researchers can, for example, exchange their views about techniques on specific or global subjects, by electronic mail (e-mail). They can also use the news groups in order to discuss precise themes. They can change files; it is easy to seeking to consult a book and to order it. Teleconferences and training since a long distance are also some interesting ways to teach. With the teleconference option, the teacher is virtually present. Another advantage of this system is the economy of resources.

### *3.4 The Necessity to Develop Statistical Software in Teaching Statistics*

Nowadays, with development of computer sciences and new technologies for information and communication, it is very useful to introduce software learning to teach statistical concepts. This implies two aspects which are development of visualisation and visual displays to teach the basic concepts, and knowing how the computer analyses data, transforms numbers makes calculations and uses equations.

The approach of development of visualisation tools tries to bring statistical science more easy, more accessible and understandable to the student. Sometimes, and even often, students want to stress visuals displays rather than numbers, equations, and formulae. So understanding all the implications of an equation or a calculation is not a trivial matter for most people, but a series of pictures, diagrams or a simple animation can illustrate very complex ideas. Then, the concern is to choose the most suitable software that will promote active self-discovery learning, i.e. inductive learning, as well as to support the instructor in the traditional lecture or laboratory setting, i.e. deductive learning. By improving this association of software in statistic teaching, experimentation will be encouraged and students can use replication to stimulate the “experimental” side of statistics. These same features can be used effectively by the teachers in the classroom or the computer laboratory. The teacher can use a software module to illustrate a concept such as the relationship between a confidence interval and a test statistic, between the chi-square distribution value and the degrees of freedom, etc. Therefore, the concept can be reinforced with a simulation experiment.

## CONCLUSION

Statistics is applied to practically all the domains of human life. But in order to have good and expected results, the use of statistics must respect some constraints linked with its techniques and scientific methodologies. In this paper, if the use of statistics in a developing country is recognised, an emphasis is put on the training of statistics and its environment of use or practice. Then the paper has raised the handicaps of statistical practice shown in its context and environment. After that, some efforts actually made in Benin have been emphasised. Finally, the paper proposes and suggests some ideas to improve statistics in a developing country like Benin. A particular emphasis is put on the development of the new technologies of information and communication tools and on the best way to use statistical software in teaching statistics.