

# **Review of the Centre of Biostochastics at SLU**

**Reviewer: Dieter R. Pelz, Ph.D.**  
**Department of Forest Biometry**  
**University of Freiburg**  
**79085 Freiburg/Germany**  
**e-mail: pelz@biom.uni-freiburg.de**

## **FOREWORD**

The review of the Centre of Biostochastics at SLU is based on

(1) personal interviews with

Eva Thörnelöf, Chairperson of the board of directors

Bo Ranneby, Director of the centre and Professor, Department of Forest Economics, SLU, Umeå

Dietrich von Rosen, Vice-director of the Centre and Professor, Department of Biometry and Engineering, SLU, Uppsala

(2) a study of the homepage of the centre detailing the activities, and

(3) a self evaluation report of the Centre

All information requested from the board members during the interviews and all additional information requested at a later stage was provided freely, all the discussions were open and frank. The evaluation of the Centre could not have been performed without the assistance of the persons mentioned above, however the results are only the responsibility of the author.

## **INTRODUCTION**

Statistical analyses and modelling in the biosciences require a good understanding of biological processes and quantitative methods. Standard statistical approaches often are not adequate for the problems at hand, special procedures have to be developed or adapted as the underlying assumptions of the standard procedures are not fulfilled.

## **THE CENTRE OF BIOSTOCHASTICS**

The Centre of Biostochastics at SLU was established to meet these needs. The main objectives are stated as follows:

- Stimulate the scientific development in mathematics and statistics
- Take actions to improve the quality of applied and theoretical research at SLU
- Perform research and methodological development
- Strengthen the contacts between researchers at SLU as well as outside SLU
- Establish a graduate school to educate students in mathematical and statistical procedures to be used in biosciences
- Participate in interdisciplinary research projects
- Be a consultant in mathematics and statistics to PhD students and researchers
- Take actions to strengthen the field nationally and internationally

The centre is a virtual setup with two locations at the Department of Economics at the Faculty of Forestry at Umeå and the Department of Biometry and Engineering at the

Faculty of Natural Resources and Agricultural Sciences at Uppsala. The two main actors are Prof. Bo Ranneby at Umeå and Prof. Dietrich von Rosen at Uppsala.

The centre is governed by a board supervising its activities with the following composition:

Eva Thörnelöf, Chairperson, Administrative Director at MISTRA

Jan-Erik Hällgren, Dean, Faculty of Forestry, SLU, Umeå

Hans Liljenström, Professor, Department of Biometry and Engineering, SLU, Uppsala

Bo Ranneby, professor, Department of Forest Economics, SLU, Umeå

Dietrich von Rosen, Professor, Department of Biometry and Engineering, SLU, Uppsala

The composition of the board is considered suitable for the tasks at hand, with an independent chairperson, the director and co-director of the Biostochastic Centre and the Dean of the faculty at Umeå and former Vice-Dean at Uppsala (as representative of the users). If the centre is expanded in the future to all 4 faculties of SLU then the composition of the board should be re-evaluated.

In addition to the governing board formal user groups should be established at the faculties to better integrate statistical theory and practical applications. At present there is already interaction on a project basis but this should be formalized for higher efficiency – seminars could be conducted where new approaches are being presented and problems can be discussed.

The director of the centre is Bo Ranneby, the Vice-Director Dietrich von Rosen

The centre was established in 2002 in the framework of a strategic plan for SLU, with an initial funding of 6 mio SEK for a planned period of 4 years. The funds have been used for supplementing existing programs in research and post-graduate programs.

The activities that have been supported include

- (1) a number of postgraduate courses in areas such as multivariate analysis, statistical inference, spatial statistics etc. in Umeå and Uppsala.
- (2) 4 completed doctoral dissertations
- (3) 4 completed Licentiate dissertations
- (4) Nordic Summer Schools in Sigtuna and Umeå
- (5) A large number of cooperation and interdisciplinary projects
- (6) Invited presentations at international conferences
- (7) Research visits abroad of the professors and doctoral students at the centre
- (8) Guest researchers (partial support)
- (9) Organisation of 2 conferences and workshops in 2004 and 2006

The conditions of statistical education at Umeå and Uppsala are quite different, there seem to be little interaction between the two locations, which partially can be explained by the distance between the 2 faculties and different subject orientation, in part there seem to be a difference in identification with the concept of the Centre of Biostochastics between the 2 main actors. In the following the two locations therefore will be discussed separately.

## **Organisation of the statistics education at SLU**

The recruitment of Ph.D. candidates in statistics/biostochastics was in the past for both locations only externally, as the internal candidates were considered not sufficiently qualified in quantitative sciences. In the long range however it seems desirable/necessary to build a consecutive program from basic statistics to advanced doctoral studies where qualified candidates can also be recruited internally (the major qualifications are both in the field of mathematics/statistics and biological sciences/forestry/agriculture). This problem was caused by organizational problems, the basic statistics education was separate from the advanced studies.

- Umeå: in the past the basic statistics education was the responsibility of another department, only recently the Centre of Biostochastics/Department of Economics was given the responsibility for the basic courses. This should in the future allow the recruitment also of internal students (a mixture of internal and external PhD students would seem desirable).
- Uppsala. On the Uppsala campus a separate unit has been created to teach the basic statistics courses. This is considered not optimal and consideration should be given to harmonize statistics education from the basic courses to advanced doctorate programs.

In the postgraduate education 4 doctoral and 3 licentiate dissertations have been completed since 2002. A total of 14 PhD courses and 2 Nordic Summer Schools have been organized. This output is remarkable considering the limited capacity of the Centre of Biostochastics.

## **Statistical Consultancy**

Consultancy in the areas of statistics and mathematics is a major responsibility of any statistical unit. In Umeå the statistical consulting was mainly done as part of joint research projects, showing the good integration of the Centre of Biostochastics in the faculty and the direct input of quantitative methods in research. No additional funds for statistical consulting are available in Umeå.

In Uppsala each year 100- 150 hours of statistical consultancies are provided. Every PhD student can have 5 hours of consultancy free, the rest have to be paid from projects. This procedure guarantees a minimum standard, however the danger does exist that more advanced and elaborate consultations are avoided due to the charged fee.

It is recommended to set the same standards at both locations – statistical consultancy should be one of the main duties of the Centre of Biostochastics – and for this activity sufficient financial means should be provided to the Centre.

## Research

The research output of the Centre is impressive, since 2002 a total of 79 papers have been published, the list of research projects in which members of the Centre have been involved comprises more than 20 projects, showing the range and scope of research projects the Centre has been active in. The Centre clearly could establish itself since its foundation as competent partner for interdisciplinary research projects, partners both within the respective faculty and in the other faculties cooperated.

The **Specific Objectives** listed for the centre were specified as:

- Graduate at least 1 PhD student annually – this has been met. With the better integration of the basic statistics education this should improve significantly in the future
- Give at least 2 PhD courses annually – this objective has been fully met
- Annually personnel from the Centre of Biostochastics shall have 5 invitations to international conferences – this has been surpassed
- Present the Centre in the Journal of Environmental and Ecological Statistics
- Always take part in an interdisciplinary project with another department or authority. As shown in the list of projects this objective has been achieved.
- Establish the centre at all faculties – this objective is rather ambitious – considering the geographic location of the 4 faculties and the subject diversity. At present the main activities of the centre are located in Umeå and Uppsala, in Skara undergraduate teaching takes place, whereas the faculty in Alnarp is not covered at present. It would seem desirable to establish the centre at all locations and integrate the activities to a larger degree as present (see comments below).

The activities of the Centre of Biostochastics at the two faculties in Umeå and Uppsala are well established, at each location research, teaching, and consulting activities of high standard take place. The integration of these activities however seems to be rather limited. For example, no joint doctoral seminars are conducted where Ph.D. students from Umeå and Uppsala could interact, there is little exchange of teachers or students. The day-to-day integration of the centre seems to be quite different at the two faculties, whereas in Umeå research proposals, project implementation, and PhD programs are initiated and implemented under the heading: Centre of Biostochastics, giving the centre a higher degree of recognition, the situation in Uppsala is such that most activities are under the name of the Department of Biometrics and Engineering, without mention of the centre.

## Visibility

The centre of Biostochastics is well established at the faculties in Umeå and Uppsala. The visibility is enhanced by the homepage, logo, and research reports. The visibility at the faculty in Umeå seems to be higher than in Uppsala, as the centre has its own marked location, in Uppsala it is apparently more considered as virtual centre as opposite to the physical location (see also the comments above). To give more visibility to the centre it seems desirable to use the name of the centre for all

applications/activities relating to statistical/mathematical methods in teaching, research, and consulting.

Although the activities are quite extensive, the international visibility could be improved. The first step would be to increase the number of international guest scientists. In addition, international workshops (e.g. under the umbrella of IUFRO – International Union of Forest Research Organisations or the International Biometric Society) could be organized and conducted under the name of the Centre of Biostochastics at SLU.

## **Finances**

The initial allocation of 6 mio SEK has been used as supplementary funds to start projects and summer schools before the final financial allocation was secured. Thus, only part of the money has been used up, the director of the centre estimates that the present level of activities can be maintained for another 1-2- years with the funds available. The use of the funds up to now is considered highly efficient, as the funds have been used as seed money for further activities (generating additional funds) or to bridge funding gaps in other projects.

With additional funding the sustainability of the activities of the centre could be secured, with a basic fixed allocation of money additional project funds could be applied for - if funds are available to prepare project proposals (for coordination costs etc.) then this could be a multiplication effect – additional research funds from outside sources could be expected.

It is recommended that the following positions are made available for the long term operation of the Centre of Biostochastics:

At Umeå and Uppsala each: 1 full time senior professor and the equivalent of 1 additional full-time position which could be split up into several part-time positions, depending on the availability of supplementary funding (from teaching or research projects).

This set-up could be the core of an international network for biostochastics.

## **Establishment of a European Network for Biostochastics/Biostatistics**

The problems and challenges of biostatistics and biostochastics are similar in most European countries, in most university or research units only partial solutions are possible due to insufficient allocation of resources – only larger scale networking can provide adequate solutions.

Teaching and research in biostochastics and biostatistics requires a high degree of expertise in statistical and mathematical sciences and a good understanding of biological processes. Pure statisticians or mathematicians in general lack the biological understanding (and often interest), biologists (pure or applied) in general do not understand complex statistical methods and models that are necessary for solving many problems. Such a European network could bring together pure and

applied statisticians/mathematicians and biologists to develop joint teaching, research and consulting programs. SLU with its Centre of Biostochastics could be the core of such a network. It is recommended to set up a network of European universities with biometric or biostatistics expertise (in agriculture and forestry) and integrate the efforts. With such a network, joint Ph.D. programs could be developed, joint research projects implemented and specialized workshops on specific topics could be organized. On the Ph.D. level specialized courses in biostochastics/biostatistics could jointly be developed and taught for doctoral students from the participating universities. This could significantly improve the quality of research and training in biostatistics and biostochastics on the European level.

With the existing Centre of Biostochastics at SLU the basic focal point already exists, with a relatively small additional investment SLU could develop as a main actor in biostochastics/biostatistics teaching and research on the European level.

Funding of networks and research consortia are available through various funding lines of the EU which could be used to build up and operate a network for biostatistics/biostochastics.

### **Recommendations:**

1. The centre of Biostatistics should be established permanently with sufficient funding for sustainability of the efforts
2. the statistics education should be made consistent in all faculties, responsibility given to the centre of biostochastics for all levels from undergraduate to post-graduate at both locations
3. mandatory statistic courses should be established for all Ph.D. students
4. Funds for statistical consultancies should be provided
5. User groups should be established in Umeå and Uppsala for an improved integration of theory and practical applications.
6. The Centre of Biostochastics should be developed as the core for a European network for biostatistics/biostochastics at universities

## EXECUTIVE SUMMARY

The Centre of Biostochastics at SLU was established in 2002 to advance the use of statistical and mathematical methods in biological applications.

The main objectives are stated as follows:

- Stimulate the scientific development in mathematics and statistics
- Take actions to improve the quality of applied and theoretical research at SLU
- Perform research and methodological development
- Strengthen the contacts between researchers at SLU as well as outside SLU
- Establish a graduate school to educate students in mathematical and statistical procedures to be used in biosciences
- Participate in interdisciplinary research projects
- Be a consultant in mathematics and statistics to Ph.D. students and researchers
- Take actions to strengthen the field nationally and internationally

The centre is a virtual setup with two locations at the Department of Economics at the Faculty of Forestry at Umeå and the Department of Biometry and Engineering at the Faculty of Natural Resources and Agricultural Sciences at Uppsala. The two main actors are Prof. Bo Ranneby at Umeå and Prof. Dietrich von Rosen at Uppsala.

The centre is governed by a board supervising its activities with an independent chairperson from MISTRA, the director and co-director of the centre and two representatives of the faculties in Umeå and Uppsala.

The specific objectives of the Centre set forth in 2002 have been met:

- Graduate at least 1 PhD student annually – this has been met. With the better integration of the basic statistics education this should improve significantly in the future
- Give at least 2 PhD courses annually – this objective has been fully met
- Annually personnel from the Centre of Biostochastics shall have 5 invitations to international conferences – this has been surpassed
- Present the Centre in the Journal of Environmental and Ecological Statistics – achieved
- Always take part in an interdisciplinary project with another department or authority. As shown in the list of projects this objective has been achieved.
- Establish the centre at all faculties – this objective is rather ambitious – considering the geographic location of the 4 faculties and the subject diversity. At present the main activities of the centre are located in Umeå and Uppsala, in Skara undergraduate teaching takes place, whereas the faculty in Alnarp is not covered at present. It would seem desirable to establish the centre at all locations and integrate the activities to a larger degree as present.

All the objectives of the Centre set forth at its start has been met, the performance of the Centre can be considered quite successful, it which received national and international recognition. The use of the funds available is highly efficient, as the

funds have been used as seed money for further activities generating additional funds or bridging funding gaps in other projects.

### **Recommendations:**

1. The centre of Biostatistics should be established permanently with sufficient funding for sustainability of the efforts
2. The statistics education should be made consistent in all faculties, responsibility given to the centre of biostochastics for all levels from undergraduate to post-graduate at all locations
3. Mandatory statistic courses should be established for all PhD students
4. Funds for statistical consultancies should be provided
5. User groups should be established in Umeå and Uppsala for an improved integration of theory and practical applications.
6. The Centre of Biostochastics at SLU should be developed as the core for a European network for biostatistics/biostochastics at universities.