

Second Workshop on Enhancement Capacity in Applied Biometrics in East and Southern Africa

Part 1: Biometric Training Resource

Part 2: MSc in Applied Biometry

16–19 July 2001 Nairobi, Kenya

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Second Workshop on Enhancement of Capacity in Applied Biometrics in East and Southern Africa

Part 1

Biometric Training Resource

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Content

1. Introduction
2. What is happening now?
3. Agreement for needs for biometric training resource
4. Biometric training resource proposed project
5. Partnership for development of training resource
6. Recommendations
7. References
8. Annexes

1.Introduction

Biometric support to researchers in Africa is not adequate and this is confounded by the complex and changing priorities of agricultural and medical research. During the last decades overseas universities trained post-graduate biometricians but it is dwindling, becoming costly and often it lacks the special features of agricultural and medical research and development in Africa. During 1999 ILRI and its partners held a workshop on "Enhancement of Capacity in Applied Biometry in East and Southern Africa" (Rowlands, 2000). The workshop recommended development of "training resources that provide biometric knowledge and information in interactive electronic form to university teachers and researchers". It was recommended that ILRI prepares, in collaboration with partners, a proposal for such a biometric training resource. To fulfill this recommendation, ILRI and University of Nairobi obtained funding from Rockefeller Foundation to hold this workshop. This workshop objective is to provide a forum for stakeholders to determine the needs, discuss the current situation in east and southern Africa, to agree the framework for development of the resources and to agree the content of the training resources. The intention is to ensure that the training resource is demand driven and that it fills the knowledge gaps as perceived by the university faculties. Output from this workshop will guide the development of a funding proposal and outlines for the development process. The workshop programme (as outlined in Annex 1) was planned to review-the current status of resources available to teachers, the experience of institutions, agree a biometrics training resource content, and agree- a framework to develop the resource- and a partnership for its development.

2. What is happening now?

2.1 Overview of staff and facilities available for teaching biometrics in sub-Saharan Africa

The status of biometrics teaching, human resources and facilities reported to the first workshop in 1999 for particular institutions in Kenya, Malawi, Tanzania, Uganda and Zimbabwe was reviewed. The analysis showed that the situation for biometry in universities is not encouraging (see Annex 2 for details). Institutions in all five countries varied in their human resources and the ratio of students or scientists to biometricians is high - not a good sign for efficient research study design and analysis. Biometricians have inadequate resources. Biometry teachers have inadequate access both to computers and to traditional curriculum. Much of the software is unlicensed. Future requirements include short courses for scientists, professional training for biometricians, further development of curricula, development of networks, and acquisition of licensed software and hardware. The situation for research stations is similar to that of universities. Nevertheless, there are some good practices emerging in universities and research institutes, that are worth consideration. Experienced scientists sometimes mentor new staff, students and staff are working together to acquire hardware and software and there is increased collaboration among institutions.

To identify the training needs of biometricians in sub-Saharan Africa, SUSAN (the Sub-Saharan Africa Network of the International Biometric Society) conducted a questionnaire survey during 2000 among biometricians working in national institutions. The responses to the survey were patchy but nevertheless 52 responses were received from Ethiopia, Ghana, Kenya, Nigeria, South Africa, Uganda and Zimbabwe. Thirty three per cent of respondents had a first degree, 49% had Master of Science and 18% had PhD degrees. Topics identified as most relevant included experimental design, analysis of variance, general linear models, multivariate analysis, sampling and survey methods. In addition to these topics, respondents identified skills in writing reports, papers and project proposals as essential. Individual institutions are keen to acquire and license SAS, GENSTAT or SPSS software.

2.2 Biometric training resources currently available at the University of Reading

The Statistical Services Centre (SSC) at the University of Reading has been involved in the development of a range of resource materials for enhancing biometric capabilities of both post-graduate students and researchers. These resources include "good practice" guides and training course materials, all written to encourage good statistical practice. Some software-related resources are also available.

The nineteen Good Practice guides were originally funded by DFID. Their target audience is research and support staff who deal with data from natural resources projects; but they can also be useful supplementary materials for biometricians involved in training and consultancy. The guides span the range of research biometric activities, from the design of an investigation and data management, through to statistical analysis and presentation of results. Their objectives are varied – for

instance some provide general guidance (e.g. on issues to consider at the research planning stage) and / or clarification of statistical concepts, whilst others aim to raise awareness or provide the skills or knowledge to tackle a particular problem.

Within the University, SSC staff run the statistics course for post-graduate students following programmes in agriculture, wildlife management and vegetation survey assessment. The purpose of this course is to furnish students with tools needed for effective research, i.e. the skills to design a range of investigations, an awareness of the importance of good data management, knowledge of how to use and interpret simpler methods, and an appreciation of complex methods. The course is approximately 75 hours, half of which is practical work. The content spans topics in planning the research, using statistical and data management software, conducting exploratory data analysis, simple analyses and modern statistical modeling ideas. There are also separate specialist sessions for the different groups of students. Materials for the course include PowerPoint for use in lectures, the Good Practice booklets, Minitab, Genstat and Excel software for practical work, and statistical games.

A collaborative venture with ICRAF has resulted in the development of a training course on "The Analysis of Experimental Data". The aim is to equip researchers with the analysis tools necessary for dealing with real problems. The course comes in two parts, and materials include lecture notes, case studies, Excel spreadsheets and practical exercises. Within the "Everyday Toolkit", design and analysis objectives are reviewed, key inference ideas are covered and participants are introduced to using the general linear model and dealing with data at multiple levels. In the more advanced "Handling Complexities" part, participants gain an appreciation of how to deal with categorical data, get more out of on-farm trials, and handle repeated measurements. Currently the materials are targeted particularly at agroforestry researchers, but they are also useful for training in other areas.

To complement the widespread use of Excel the SSC has a short 3-day course on "Excel for statistics: what you can do", and an SSC-written Excel add-in which has been developed to carry out simple data manipulation tasks and statistical analyses. Instat+ is a locally-produced software for simple statistical analysis, for supporting the teaching of statistics, and the analysis of climatic data. It is aimed at both trainers of statistics and scientists. Also available, for the new user of Genstat, is a Genstat Introductory Guide that was produced jointly with ICRAF.

The good practice guides, the analysis course materials and Instat+ (free to single users) are all currently available at the SSC web site (www.reading.ac.uk/ssc). Many of our materials are new, and are still developing, but we would like to encourage use of these materials, and welcome feedback on them, and new ideas for collaborative work.

2.3 Training resources strategies at ILRI

ILRI plans to prepare a set of at least eight training resource products that taken together will provide university faculty and researchers with the material to improve teaching and support improved research on the interactions between crops and livestock as a way to improve the livelihoods of smallholder farmers. One of these

modules will focus on biometric techniques, but each of the other seven will also contain significant biometric components. The strategy calls for ILRI to work with partners to develop the training resources. So far ILRI has entered into partnership with universities in Africa, Southeast Asia, Europe and North America, and one module, Animal Genetic Resources, is well advanced.

ILRI adopts a more specific definition of the term training resources, namely: *an interactive electronic knowledge and information package that provides, in an integrated manner, resources for teachers and trainers on specific subject areas.* It has developed a framework for development of such training resources (Annex 3). The products will be computer-based products, which are web-enabled but initially will be on CD-ROM. When access to the Internet in many SSA countries is improved, the training resource will be placed on the web.

The framework in each training resource contains a number of modules (Annex 3). These modules are the closest the product comes to a text book, as each module summarises a set of basic knowledge of the subject area. The modules are summaries and not exhaustive treatment of the subject. ILRI believes that university faculty staff are trained professionals who are well versed in their subject matter. The information in the modules is generic as it makes no mention of any place nor any specific example or illustrative material. The modules form the 'backbone' of each training resource, i.e. the first layer of knowledge. All the material providing the local and regional relevance comes in other resources, i.e. the second and third layers of knowledge. The latter include case studies, literature, exercises, video clips, photographs, maps, databases, glossaries, etc. All these resources are embedded within the core knowledge (i.e. the modules). The case studies form one of the most important resources in each training resource. Each case study is a complete story based on a practical fact, concept, method or a development activity. This allows the teacher to bring reality and local relevance to teaching facts and ideas.

The training resources are intended to help the preparation and implementation of research projects by graduate students and established R&D professionals, and, in this way, to improve the quality of R&D.

The construction of each product is a complex task, managed by a development team within the overall training resource project. Each team is made up of subject matter experts, information specialists, and web graphics and database designers. The subject matter experts come from ILRI research programmes, project partners from African, Asian, Latin American, European and North American universities. The development teams also benefit from "reference groups" (partnerships with colleagues from universities and research institutes in developing countries), which help with product review, the identification and preparation of case studies and the evaluation and test of final versions.

2.4 Case studies

To illustrate the concept of case studies, as presented in the framework described above, two case studies were presented by staff from the University of Nairobi. The case studies focused on "Calculation of sample size – an example in experimental design" and "Regression analysis – an example in quantitative methods". The presentations and the discussions that followed illustrated the value of case studies for

teaching. It was clear how case studies could illustrate complex concepts by using real life examples. It was agreed that university faculties could use case studies in innovative ways to explain concepts, stimulate group work and discussion and present study questions. This demonstration of the concept proved very useful in guiding the workshop participants in identifying case studies from their own work at subsequent group sessions (Annex 4).

3. Agreement for needs for biometric training resource

The workshop participants agreed that faculties in African universities that teach applied biometry to post-graduate students in agriculture, medicine and life sciences need training resources that provide biometric knowledge and information (see Annex 5 for list of university faculties from sub-Saharan Africa represented at the meeting). The previous workshop, together with other studies by CTA (Riley, 1998) and SUSAN (referred to above) confirmed that universities in sub-Saharan Africa lack biometric resources. It was stressed that the biometric training resources should bring into focus the real life situation examples from Africa.

4. Biometric training resource proposed project

4.1 Project title

Research study design and analysis – getting results from research: a training resource for faculty trainers in agricultural, applied biological and medical sciences.

4.2 Overall objective

To enhance effective teaching of biometry through illuminating real-life case studies and other resources provided in the form of an electronic training resource.

4.3 For whom is the training resource?

1. The primary audiences are university faculty trainers in biometrics of post-graduate students in agricultural, biological, socio-economic and environmental science
2. A second audience is university faculty trainers of post-graduate students of biometry
3. A third audience is university faculty trainers in biometrics of medical students in the fields of community medicine

The meeting agreed that the training resource should focus on agricultural issues in the first phase with limited allowance for medical and health issues. Medical issues provide different forms of complexity and it was considered advisable to keep the development of the training resource in the first instance within manageable limits. Since the modules are generic they will allow further expansion to populate the resource with case studies for audience 3.

4.4 What are possible modules?

The meeting agreed that the resource aims at stimulating faculty and trainers to think problem solving rather than traditional statistical teaching. The trainers should prepare their post-graduate students to aim at working with researchers to help them solve research problems. During group discussion the following modules, which are the core material for the training resource, were agreed:

Module 1: Research strategy

- Deciding research objectives
- Choosing the type of study
- Overview of concepts and basics

Module 2: Study design

- Planning the study
- Accounting for variation
- Sampling
- Designing an experiment
- Designing a survey

Module 3: Data management

- Collecting data
- Organising data
- Storing data

Module 4: Data exploration

- Looking at data
- Describing data
- Formulating statistical models

Module 5: Data analysis

- Modelling data
- Handling variation
- Applying different statistical techniques
 - . analysis of variance
 - . regression analysis
 - . general linear models

Module 6: Reporting

- Interpreting and presenting results
- Communicating -research results

The meeting noted that the resources should be functionally interactive and have computing featured in all the modules. It was agreed that the case studies will illuminate concepts and methods across the different modules. The modules should address understanding multiple approaches to the same problem rather than applying a recipe approach. The training resource should increase the range of areas in which skills can be applied.

4.5 What are possible case studies and other resources?

Working groups met and identified case studies from their experience. At this stage the commitment for preparing the case studies will be subject to future communication with the institutions concerned and funding for the project.

Possible Case Studies

Workshop participants suggested case studies from their experiences (Annex 4). Since case studies are developed to explain concepts or methods, it was necessary to identify in which modules this would take place. It was clear that most case studies can be linked to more than one module and in some cases they link to all modules. A total of 29 case studies were suggested. Of course it was agreed that the resource may contain more case studies if need be. At this stage the list represents a commitment in

principle. An analysis of the list reveals the distribution of case studies among the various disciplines in agriculture and health. Twenty three case studies deal with agricultural problems and the remainder with medical/health issues. The agriculture case studies deal with animal science, crops, agroforestry and some are general.

Other Resources

Other resources were discussed briefly. They include virtual library, exercises, video clips, photographs, animated illustrations, etc. All innovative ways will be used to make the resources interactive. For example video clips can be used to illustrate study locations, treatment layout or experts discussing research study design. Software is important and it was agreed that the coordination group should seek all means to get permission through special arrangements with a software company.

5. Partnership for development of the resource

To produce the biometric training resources it was agreed that collaboration among all the stakeholders is necessary. All representatives in the meeting agreed to recommend that their institutions be partners in producing the training resource (Annex 4 shows list of institutions). ILRI will approach the management of these institutions to seek their formal agreement. ILRI was designated as the lead centre in view of the available human and IT resources in ILRI. A mechanism to coordinate the development of the training resources was agreed. A Coordination Body will lead the development process. All partners will own the training resource and will contribute to the development of various resources. The collective list of partners will form a Reference Group that will assist the Coordination Group.

6. Recommendations

1. All representatives at the workshop agreed that institutions in Sub-Saharan Africa need biometric training resources that provide biometric knowledge and information in interactive electronic form to teachers and researchers. To obtain commitment from those institutions represented at the meeting as partners in the development of the training resource, the workshop recommends that ILRI communicate with the management of the institutions inviting them to participate.
2. The workshop recommends a group, to be led by ILRI, to coordinate the development of the biometric training resource. The Coordination Group is made of ILRI, University of Nairobi, University of Natal, University of Reading and ICRAF.
3. The Coordination Group was delegated to raise funds for the development of the biometric training resource.
4. The framework being followed by ILRI to develop training resources was supported as the mechanism to develop the biometric training resource.
5. ILRI will have the copyright and all partners the ownership of the training resource.

7. References

Riley, J., 1998. Strengthening biometry and statistics in agricultural research. Study report. CTA (Technical Centre for Agricultural and Rural Co-operation), Wageningen, The Netherlands. 27 pp.

Rowlands, G. J., 2000. Enhancement of capacity in applied biometry in East and Southern Africa. Proceedings of an ILRI workshop held at ILRI, Nairobi, Kenya, 7-9 December 1999. ILRI (International Livestock Research Institute), Nairobi, Kenya. 115 pp.

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