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The biometrician as a research collaborator

by
John Rowlands

International Livestock research Institute, P.O. Box 30709, Nairobi, Kenya

Abstract

The research method skills of study design, data management, data analysis and reporting are all tools in the research process. Increasingly, researchers are developing these tools. Nevertheless, there is still an important role for the biometrician, especially if he/she can participate in research in a collaborative way. Because of the biometrician's wider exposure to different fields of research and his/her ability to think objectively, logically and laterally, he/she will often think of other ideas or solutions. But biometricians must get involved; they cannot simply wait for researchers to look for them. This paper draws on experiences during my career to illustrate how I have been able to get involved in research projects. It also describes some of the attributes that a biometrician needs to become part of a research team.

Introduction

The research method skills of study design, data management, data analysis and reporting are all tools in the research process. Increasingly, researchers are developing these tools. Nevertheless, there is still an important role for the biometrician, especially if he/she can participate in research in a collaborative way.

"If we wait for a scientist to come along with a query then it is unlikely we will understand the complex situation sufficiently to be able to contribute much."

"If we do not get involved we shall have only ourselves to blame." (R. Coe, 2000)

These statements were made at a workshop on "Enhancement of Capacity in Applied Biometry in East and Southern Africa" held at the International Livestock Research Institute in Nairobi in December, 1999 (Rowlands, 2000). This workshop was attended by biometricians and scientists from national universities and research institutes across sub-Saharan Africa. Two of the proposals put forward at the workshop have since been implemented: firstly, a Regional Applied Biometrics MSc programme based at the University of Nairobi and secondly, the development by ILRI and partners of an electronic "Biometrics & Research Methods Teaching Resource", reported earlier at this meeting. But I wonder to what extent over the last six years those of us working as biometricians in sub-Saharan Africa have 'truly got involved'.

Whether by luck or design I have during the course of my career been fairly successful in 'getting involved'. After five years working in Scotland and Canada within statistical

service groups of biometricians I decided that I would like to ‘jump over the fence’, as it were, and get a job working with scientists. I moved back to the UK and was appointed as head of the ‘Statistics Section’ at the Agricultural Research Council’s Institute for Research in Animal Disease’, as it was then known.. I soon began to work alongside scientists researching in a project on metabolic profiles in cattle, and I can always remember a comment one day made by the head of the project. I was sitting in his office when the phone rang. After a little while he said to the person on the other end “By the way, I’ve got John Rowlands with me – he’s our Institute’s biometrician –but he’s not just a biometrician, he’s a scientist”. That, of course, was far from the truth but I was naturally flattered by the complement. From that point on I have been able to appreciate the collaborative role that biometricians can play in research and the need for them to ‘get involved’.

Collaboration

So what is collaboration? Figure 1 shows a typical research process. At the beginning of a research project the team of scientists will need to plan a strategy for their research. For example, they may need to decide whether a preliminary survey is necessary or whether they have sufficient baseline information to launch straight into the main study. They also need to decide whether they should start to work on farm or whether more controlled experiments are first needed. We can call this ‘research strategy’. From then on there may well be a series of studies, each to be designed, executed, each with data to be collected, managed and analysed. Then for each study some form of exploratory and descriptive analysis is ideally undertaken to look for patterns in the data before more formal statistical modelling is done. Finally a report is written.

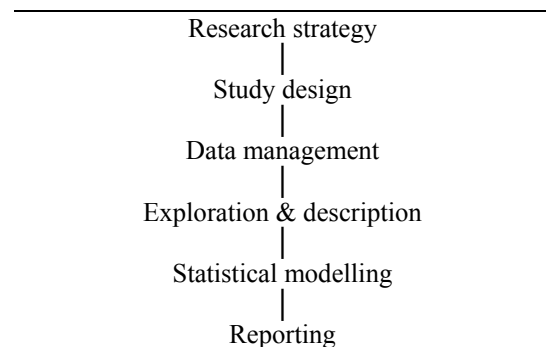


Fig.1 A diagrammatical illustration of the stages involved in a research process

So where does the biometrician come in? So often one hears a biometrician complain (as illustrated in Fig.2) that he or she finds that he or she is only consulted when a researcher comes and says ‘I have collected these data – can you help me analyse them’? Other researchers may be more competent in data analysis and are able to do some of the preliminary exploratory work first before coming to seek the assistance of the biometrician in carrying out a formal analysis. Sometimes the biometrician, on doing the analysis, finds faults in the study design – perhaps insufficient replication or possibly some element of partial confounding.

So what does the biometrician do? Certainly in the worst of these scenarios the last thing he/she should do is complain. Maybe a particular study is impossible to rescue. But more often than not it may be possible to do something with the data. The biometrician should try and use each opportunity to politely explain the experimental shortcomings and suggest ways in which the study might have been done better. This will be the time to express interest in what the researcher plans to do next and to offer possible suggestions. Gradually regular consultations could then begin and a situation develop as depicted in Fig. 3.

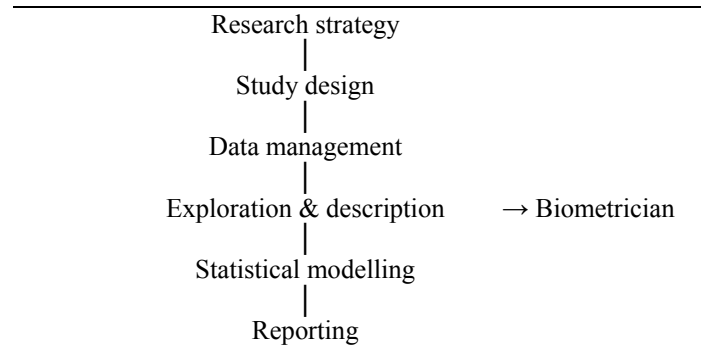


Fig.2 An example of a researcher asking what he can do with his/her data

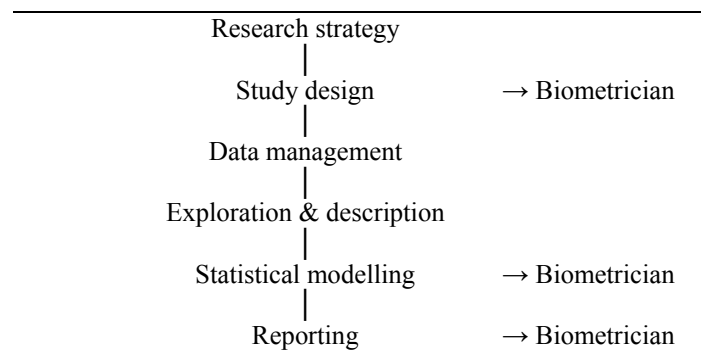


Fig. 3 An example of a biometrician becoming consulted more regularly

Real collaboration will not start, however, until arrows start to appear on the other side (Fig. 4), but it has to be the biometrician who puts them there. This is what should be understood by ‘getting involved’. Ultimately an applied biometrician’s goal should be to find him or herself working alongside a researcher, fully involved in the research programme (hopefully with arrows at all stages and on both sides), prepared to discuss future plans based on the results of the latest analyses, teaching the researcher different aspects of study design and analysis, designing data management systems, writing up results and critically reviewing reports written by the researcher.

It is the role of a biometrician to help researchers advance their own research method skills. However, the ability of individual researchers to do so will vary depending on

their general aptitude and interest in statistics. Indeed, not everyone can be expert in every discipline, and people need to recognise the expertises of others. The biometrician has a special expertise that makes him or her an essential part of a research team. Because a biometrician has been trained to think objectively, laterally and logically, he/she is able to stand back and make balanced judgements. Indeed, even a researcher with excellent research method skills will find it fruitful to share his/her ideas with a biometrician. The researcher will often have become ‘too close’ to his/her data whereas a biometrician, because of his or her wider exposure to different fields of research may think of other ideas or solutions. But the biometrician must ‘get involved’ – he cannot simply wait for the researcher to come to him.



Fig. 4 A collaboration between researcher and biometrician starting to materialise

Qualities

So what qualities does a biometrician need to qualify as a research collaborator? It is worth looking at some of these attributes as listed in Table 1. Clearly one needs a good basic training and fair level of work experience. I was fortunate in being able to start my career in the midst of excellent and talented biometricians. In sub-Saharan Africa applied biometricians tend to be a rare breed. This makes it especially difficult for young biometricians, who often find themselves working alone, far from the nearest place where they can seek the help of a more senior biometrician. One solution is for the more advanced institutions to offer short-term attachments to young biometricians. Both ILRI and the ICRAF have, for example, been doing this but additional links are needed with other institutions in the region.

A collaborative biometrician needs to be interested in the research being carried out. Sometimes I found that I had to pretend that I understood that a researcher was telling me. This is quite a good ploy and I usually managed to deceive my client. But I usually did a bit of homework afterwards so that I didn't get caught again. But this can work both ways, so beware – a client often does not fully understand what a biometrician is saying.

Once I began to get fully involved in research I began to realise that, unlike what I had learnt at university, statistical design is often only a small component of good

experimental design – there are other equally important contributing factors, scientific and analytical in nature. One has to learn to compromise, both in design and analysis, to respect the researcher’s point of view and accept that he/she may often be right. In order to gain the researcher’s trust a biometrician needs to be patient and respectful.

Table 1. Some of the attributes that a collaborative research biometrician needs to have.

Have a good basic training and experience in the application of applied biometrics
Be interested and want to understand the research topic.
Be able to gain the researcher’s trust.
Respect the views of the researcher.
Be a good teacher.
Be able to ‘stand back’ and use one’s skills in objective, logical and lateral thinking.
Be able to write well and be able to critically review what others write.
Be able to defend in public a contribution that one has made to a research report
Be confident in standing one’s ground, but at the same time be willing to compromise.
Understand that statistical design is only one, often small, component of research methods.
Be patient – don’t be pushy, wait (but not too long) for the researcher to come back.

A good writing skill is essential. Scientific writing is a skill that is not easily come by but one that has to be learnt through practice. After writing a report it is important to seek the opinions of someone who is a good critique and willing to comment on what is written. One must not get upset if one’s first reports are pulled to pieces. A scientist at the Institute for Animal Health was renowned for his reviewing expertise. All our papers were torn apart but we learnt that if we wanted to get a paper published we needed to get him to read it first. Indeed it is much better for a paper to be thoroughly reviewed internally within an organisation before it is sent for external review. The biometrician has an important role to play within the critical internal review.

As I have already mentioned, the skill that makes the biometrician such an important collaborator and team player is the training that he/she has acquired in being an objective, logical and lateral thinker. A biometrician is able to stand back and judge on probabilistic grounds the likelihood of a scientific outcome being real or not. A few years ago I was invited to help to provide a statistical solution to a matter that had been concerning certain members of a scientific team at ILRI. Indeed, the matter had assumed such importance that scientific tensions had begun to develop within the team. I quietly developed some statistical methodology that was required to resolve the problem, whilst at the same time distancing myself from the tensions. Individual project members gradually began to appreciate the value of the contribution that I was making and people became at ease with each other again. The important thing was that I was not a threat to anyone.

Conclusions

Collaboration is not always easy. Some researchers may be proud and not wish to collaborate – others may be difficult to work with. But there is no alternative. Multi-

disciplinary research is now the only way forward if poverty in sub-Saharan Africa is to be alleviated through sound scientific research. The agricultural research focus is changing, not just in sub-Saharan Africa but also throughout the world, and now includes agro-ecosystem research, integrated approaches to problem solving, natural resources management perspectives, participation of farmers and an increasing emphasis on providing information about alternative options rather than optimal packages. (Lynam, 2000).

Nowadays biometricians must 'get involved' if they are to be effective, not only in promoting their discipline, but also in ensuring that biometrics is at the heart of each and every research programme.

References

Coe, R. 2000. The impact of the changing agricultural focus on biometric methods and the role of the biometrician. In 'Rowlands, G.J. (editor), *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*'. International Livestock Research Institute, Nairobi, Kenya, pp. 6-8.

Lynam, J. 2000. The changing nature of agricultural research in Africa. In 'Rowlands, G.J. (editor) *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*'. International Livestock Research Institute, Nairobi, Kenya, pp. 3-5.

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*. International Livestock Research Institute, Nairobi, Kenya, 115pp.