

Capacity building for sustainable use of animal genetic resources¹

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Abstract

Africa has a challenge to meet the rising food demands that will come about due to increased population size and urbanisation. Such challenges can be tackled in many ways that include improving livestock production and this entails making improvements in feeding and disease control, using appropriate genotypes and genetic improvement of livestock. Research and training are some of the major requirements to realisation of improvements in livestock production. Sub-Saharan Africa has a number of colleges and universities and research stations that do postgraduate training and research in animal breeding and genetics. It is important that training and research at these institutions is relevant to Africa's needs so as to produce scientists that will become trainers or take up leadership in research and development in animal breeding including sustainable use of animal genetic resources. The International Livestock Research Institute (ILRI) and the Swedish University of Agricultural Sciences (SLU) have initiated a capacity building project. This project aims to address training of researchers in animal genetic resources by introducing a new model of capacity building which targets qualified lecturers and researchers working in sub-Saharan African universities and research stations with a specific focus on making graduate training in sub-Saharan Africa more relevant to the region. The paper describes the project in terms of identified needs and expectations of stakeholders, the capacity building model developed to address these needs

and the activities that are to be undertaken to meet the project outcomes. The project activities include a training of trainers course, building partnerships and developing computer-based training resources for use by university lecturers and national scientists. The proposed project evaluation procedures are also presented.

Introduction

The increased demand for livestock products has been putting pressure on African livestock owners to increase production. Steps taken to increase production included identifying and using high-producing genotypes. Unfortunately for Africa, little attention was paid to improving the genetic potential of local breeds for increased production. Instead, a view was taken that increased production would be best realised by importing foreign high-producing breeds and using them in purebreeding and crossbreeding systems. The introduction of these foreign breeds was made easy by advances in biotechnology, particularly advances in artificial insemination. This crossbreeding and/or replacement of indigenous breeds with foreign germplasm is one of the most serious threats to indigenous populations. In addition, the system is also not sustainable, as most foreign breeds are generally not adapted to African production conditions. With the expected further increase in demand for meat and milk in developing countries between now and 2020 (Delgado et al. 1999), there is even a greater need to develop and promote sustainable ways of livestock production. This will place significant new demands on national capacities for research and development in developing countries.

Even though research training is introduced at the undergraduate (BSc) level in most universities, it is at postgraduate level (MSc and PhD) that most of the research training is done. The number of national scientists for livestock research and development continues to be a cause of concern (Wilson et al. 1995). In 1986, there were fewer than 1000 livestock researchers in the national agricultural research institutes in African countries with a BSc training or above, and just over 300 with PhD degrees. Whilst most universities in Africa now have courses in the agricultural sciences, considerably fewer provide post-graduate training (Pardey et al. 1997). Africa has, therefore, relied on sending its people overseas for postgraduate training. However, postgraduate courses are increasing in universities in sub-Saharan Africa. Scientists trained at these universities are absorbed (as staff) by local universities and local research and development institutes.

The pace of scientific progress is increasing and this continues to affect both what can be achieved by agricultural research and how it is to be achieved. New tools and approaches in both molecular and quantitative genetics are supporting radical changes to what can be achieved through animal genetics. These techniques can be applied in characterising indigenous animal genetic resources and that information can promote their use in sustainable breeding programmes. There is a need, therefore, to provide national scientists with the skills and knowledge to allow these techniques to be used (FAO 1997). Another concern has been that scientists are often locked in their disciplines and are poorly prepared for systems research addressing the many components of sustainable animal breeding programmes structured to meet the needs of farmers (FAO 1991). The situation, in some cases, is made worse by the fact that most materials used in training are disciplinarily based and do not encourage thinking and planning at the systems level. In addition, most of these materials use examples and case studies from unrelated environments making them irrelevant thus often confusing the concept or principle being presented. There is, therefore, a need for capacity building on sustainable use of animal genetic resources to; help scientists build on their knowledge on current techniques in animal breeding, to ensure that scientists address the issues of sustainability in animal breeding, and to emphasise the use of relevant training materials.

The approach that has been taken by ILRI and other organisations in capacity building for research has been to hold short-term courses for the scientists. The scientists would then go back to their research stations and use the new techniques. A new model of capacity building has been adopted by the ILRI/SLU project. It stems from the realisation that most of Africa's researchers are now being trained at local universities. This model introduces three concepts. Firstly, it is based on the assumption that training of researchers and university lecturers who teach at postgraduate level has an amplified impact than training researchers alone. This is because lecturers, besides carrying out research themselves, also train postgraduate students (future researchers) who will then use the skills learnt from the lecturers in their own research. The benefits of capacity building using this model, therefore reach more researchers. Secondly, the model encourages the use of relevant resources for training of Africa's research scientists. Such resources can be made available at universities in Africa and overseas universities that train African students. Thirdly, the model calls for developing partnerships with universities and NARS. The project is demand driven as it caters for the needs of partners who also contribute to the output. This paper describes the ILRI-SLU capacity building project that employs this new model of capacity building.

Needs assessment activities

The project carried out need-assessment activities to determine the number of universities in sub-Saharan Africa that teach animal breeding and genetics at the postgraduate level, the content of the courses taught, human resources and facilities available for running the courses, constraints faced by universities when delivering the courses and the link between universities and research institutes carrying out research in animal breeding and genetics. Questionnaires were sent to fifty-three universities in sub-Saharan Africa by mail. An ILRI/SLU team followed up by visiting six countries in Eastern and Southern Africa.

Only 23 out of 53 universities responded to the questionnaire and of these only 17 offered postgraduate training in animal breeding and genetics. The countries visited were Kenya, Tanzania, Uganda, Lesotho, South Africa and Zimbabwe. The findings of these two activities were:

- The number of staff with postgraduate qualifications was impressive with 74 percent having PhDs and the rest MSc degrees. In addition, each university produces an average of six postgraduate students per year. The starting point for the project would, therefore, not be to give basic postgraduate training in animal breeding and genetics but to offer a course, which would allow participants to update their skills. Most lecturers had received little or no training in teaching methods or university teaching. The postgraduate classes are generally small, an average of six per year, but the same lecturers teach very large classes at the undergraduate level. Therefore, lecturers need to be taught teaching methods for both small and large groups.
- The postgraduate degree programmes vary a lot in terms of the actual courses offered and the course content. The courses include statistics/biometry, computer courses, biochemistry, physiology, production, genetics (basic, population, quantitative, molecular), and research methodologies. However, little or no time is spent on conservation of animal genetic resources. Most universities said they needed strengthening in statistics, basic and molecular genetics, animal genetic resources (characterisation, conservation, utilisation and management) and sustainable breeding programmes.
- Modern textbooks are often lacking. In addition, books and journals used are those published in Europe or North America. These resources provide useful information on principles and concepts of animal breeding and genetics. However, they are often lacking in examples relevant to sub-Saharan Africa.
- Universities had access to computers although the access was rather limited for some -

- in numbers and quality of computers. Various statistical software were available.
- The availability of molecular genetics laboratory facilities varied - some universities had none yet some had more than one laboratory in one campus, e.g. one in a faculty of agriculture and the other in a faculty of science or veterinary medicine.
 - Most universities do not generate data that can be used in animal breeding and as such rely on data collected by research institutes or organisations running livestock recording schemes. There is, therefore, a need to promote good links between research, extension and universities. The need for collaboration is realised and is practised in some countries.
 - Collaboration between universities is limited and is mainly through external examiners. There is limited exchange of teachers and students between universities. Increased contact between institutions and countries would reduce the isolation of staff at some universities. The project should therefore promote collaboration.
 - Funding support is limited resulting in poor facilities and resources for research and teaching, heavy teaching loads and high staff turnover.

A workshop, with participants from universities and research institutes in sub-Saharan Africa, ILRI, SLU, Cornell University and the African Development Bank, was organised to discuss the findings given above and to plan project activities. The workshop recommended that training courses for lecturers and researchers to update them on recent techniques and methodologies and topical issues in animal genetic resources should be held. The production of training resources to supplement available books and journals was also recommended. The main emphasis of these resources would be case studies that are relevant to sub-Saharan Africa and written using information collected by research organisations and extension agencies, universities and international organisations. Teachers need teaching and learning resources that are relevant to their country or the country of origin of their students, and which provide them with the tools to strengthen their teaching by using material that their students can relate to their present experience and future responsibilities. The participants identified the following modules on which the training course and training resources would be based:

Animal genetic resources for sustainable agriculture

- Improving our knowledge of tropical indigenous animal genetic resources.
- How to make breeding programmes in tropical farming systems sustainable?
- Quantitative methods to improve the understanding and utilisation of animal genetic resources.
- Teaching methods and communication.

They also developed the contents of these modules. A third recommendation was the building of partnerships; among the sub-Saharan universities, universities and research organisations within the same country, and ILRI and SLU with the universities and research institutes. The workshop participants agreed to act as a reference group for the project. This reference group would assist in identifying course participants, identifying scientists who would write the case studies, and evaluating the training resources. More than one course will be held and participants for each course will be drawn from a number of countries thus allowing links between countries. Course participants will also be asked to evaluate the courses and training resources.

The project's main activities

Based on the concerns and issues identified by the project through the needs-assessment activities, ILRI and SLU, together with partners from universities and research institutes in sub-Saharan Africa, embarked on the project "Capacity Building for Sustainable Use of Animal Genetic Resources in Developing Countries". The project planned three main activities:

training teachers and researchers on animal genetic resources via a series of courses, building training resources, and developing partnerships.

Training courses

The training courses for sub-Saharan Africa will be based on the modules agreed on at the planning workshop. They will cover topics on: (a) techniques in animal breeding and genetics and their use in characterisation and conservation of African animal genetic resources, (b) the importance of indigenous breeds, sustainable breeding programs and the utilisation of indigenous breeds in such programs, and (c) teaching and supervision of university students. Participants will get a chance to search available databases including those that are being developed by the project, use livestock recording and statistical packages, and computer software used in teaching some animal breeding and genetics principles. They will also evaluate the training resources produced by the project.

Criteria for selection of course participants were developed at the workshop. The ideal would be to have two participants per country, one from a research institute and another from a university. The participants should be people who are likely to work in research or teaching for a minimum of five years after the course. It was also agreed that a maximum of 25 participants per course would be ideal, making it necessary to hold more than one course in Africa. The first of these courses was to be a three-week course to be held in November-December 2000 in Addis Ababa, Ethiopia. Sixteen participants would come from East and South African countries. Facilitators for the first course would be from SLU and ILRI.

Training resources

This project will develop training resources to be used by university teachers responsible for teaching animal breeding and genetics to postgraduate students from sub-Saharan Africa. The teachers may be in the universities of sub-Saharan Africa, or wherever young professional from Africa are taught, including the international degree programmes of North America, Europe and Australia.

The term training resources has different meanings for different users. It is often used in reference to lists of courses and/or materials on the Internet. This project 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. Because university faculty know the facts and principles of their subject material, the resources are not an attempt to write an electronic textbook. The resources being developed are not an attempt to promulgate a fixed and "ideal" curriculum. Where a university is in the process of developing a new curriculum, the project's training resources will offer a structure and content that may be helpful. In most situations, however, we envisage university faculty using the resources to extract and adapt material that will strengthen existing lectures and practicals, and to provide insights and resources for the development of new lectures and practicals within existing courses.

The animal genetic training resource CDROM is based on five modules identified at the workshop. Figure 1 shows a general structure of a training resource. For each module, an introduction that summarises a set of basic knowledge, principles and concepts was written. We refer to this material as the "core knowledge". It should be emphasised that the introductions are a summary - albeit a comprehensive summary - and not an exhaustive treatment of the subject. The information in the introductions is structured to help engage the attention and interest of users - both faculty and students.

All the other resources complement the core knowledge in the modules. The opportunity to link information in a web based product means that these other resources are woven into the core

knowledge, but they can also be accessed directly. The other resources include case studies, information on distribution of breeds mentioned in the module introductions and maps, images and video clips, problem solving exercises, bibliographies and full text documents, databases, glossaries and dictionaries, research methodologies and software.

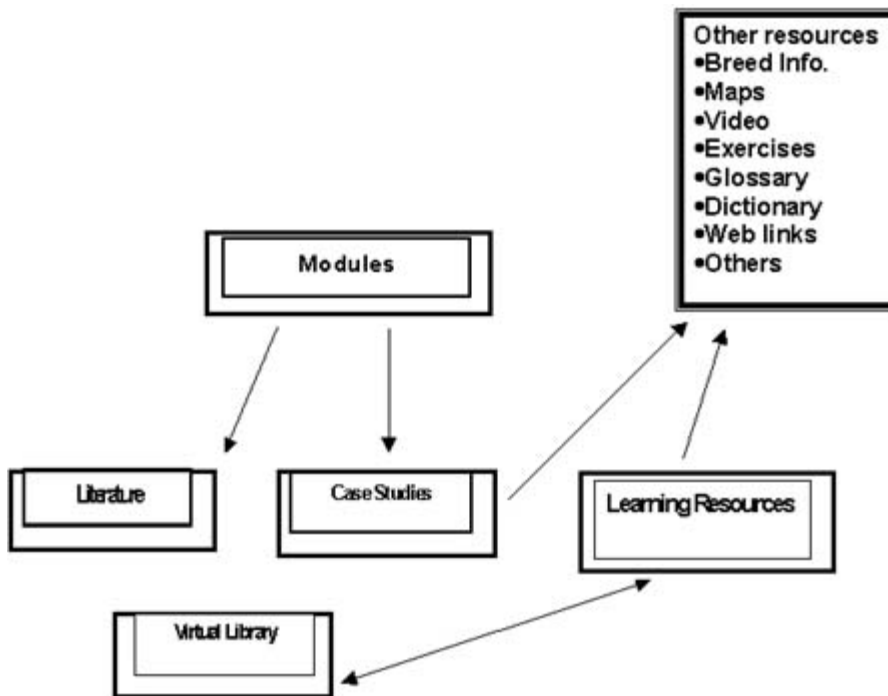


Figure 1: The general structure of training resource.

The case studies from sub-Saharan Africa will form the most important set of resources in the training resource. Because they are linked to a particular fact, concept or principle in a module, they provide users with information that helps to bring reality into what otherwise may be purely theoretical and factual presentation, concept or principle. Each case study will be a complete study and story and each is based on a practical situation. Case studies will present examples where investigations worked and where they did not, and examine why some were successful and others were not. Where appropriate, each case study will:

- improve the understanding of a key fact, principle or concept
- achieve that understanding by using practical information relevant to the country or region of the users, or the people they are training
- identify gaps in knowledge
- provide guidance on possible research methodologies to address gaps in knowledge.

The case studies will be written by ILRI and SLU staff and scientists working for universities and research institutes in sub-Saharan Africa. Up to date about 20 case studies have been written.

The resources are designed to be downloaded by teachers. The teachers can use the resources as they are or adapt them to be used in their own course work. All the resources comply with established pedagogic principles and aim to create learning environments. At the same time, the resources are flexible enough for the teachers to use information to suit their own situation.

Partnerships

ILRI developed and maintains a collaborative network of animal genetic resources scientists in

sub-Saharan Africa. This project was planned to be demand-driven hence made extensive use of existing networks. The project team formed partnerships with research institutes and universities in sub-Saharan Africa for planning and implementation of the project activities. The course and training resources are produced in partnerships with colleagues from universities and research institutes. Based on agreed work plans all partners will contribute to the content, design and functionality, and testing of the animal genetics training resource and the course structure.

The primary beneficiaries are university lecturers and research scientists in sub-Saharan Africa and those teaching international agricultural programmes in universities in developed countries. As a result of using the training resources, these people will have an impact on present and future policy makers, socio-economists and agricultural researchers. Animal breeding/genetic scientists will have access to better materials to strengthen the practical relevance of their teaching, research and policy making. Secondary beneficiaries include researchers and development agents in sub-Saharan Africa. This target audience will have a greater and more relevant understanding of key areas of animal genetic resources in their own countries. Faculty in developed countries who teach international agricultural courses to graduate students from sub-Saharan Africa will also benefit from the training resource. The final and ultimate beneficiaries are the smallholder crop-livestock farmers in developing countries who will receive new technologies that have an impact on productivity, household and national economic development and do so in ways that are environmentally sustainable.

Expected outcomes and project evaluation

Expected outputs

This project will facilitate the introduction of recent techniques/advances in animal genetics and breeding into the graduate curricula of African universities. In addition, by introducing university teachers to teaching aids and methods, it will help improve graduate supervision and effectiveness of teaching of these subjects, not only at the graduate level, but also at the undergraduate level. Indeed, this project could serve as a model through which effective teaching is disseminated throughout entire university systems.

Training resources (both electronic and print) is possibly one of the most significant potential outputs of this project. As has been alluded to, the resources will aim at providing technical material which those involved in graduate training can use to make animal breeding and genetics more interesting to students and relevant in the African context. These resources will include case studies and numerical examples, illustrated with images, video clips, etc. and supported by relevant bibliographic information. Moreover, because these resources will be in electronic form, their continued future updating will be relatively easy. Such updating could involve inclusion of links to independently developed, and continuously updated, Internet sites. Not only will provision of these resources to university teachers ensure that the courses are relevant and that teachers and students are exposed to recent technologies, it will also improve access (by both teachers and students) to the information they need for their research.

To the extent that postgraduate training provides the next generation of teachers, researchers and policy makers, this project will, through a substantial multiplier effect, ensure that capacity for animal genetic resources research and development is improved in Africa, and that the level of public awareness on sustainable use of animal genetic resources and related issues is tremendously enhanced.

Project evaluation

The Delivery Pathway will be initially through individuals who participate in the training courses. Two such courses are planned for Africa: one for Eastern and Southern and another for West and Central Africa. This will be sufficient to cover the majority of universities in sub-Saharan Africa which offer postgraduate training in animal breeding and genetics.

On return to their respective universities, course participants are expected to share the information gained from the course with colleagues. Initially, this information will be technical notes in print form. Recipients will be requested to make this material available to all those involved in animal breeding/genetics training at the graduate level in their countries. Contacts for additional information and/or comments will be provided, as will a website address from where detailed information on the training resources could be obtained (at a later stage, the entire product will be made available on the Internet).

The evaluation of electronic training resources will be continuous. The first step was to develop a demonstration CDROM which was evaluated during the planning workshop. The Beta version of the CDROM will be tested by the participants of the training courses and by the reference group. Feedback from testing the beta version will be used to improve the application and version I will be released at the end of 2001 for wider testing by universities in sub-Saharan Africa.

Evaluation of the impact of the whole project will involve an assessment of users' opinion. Users will include the following categories: those who will have attended the course; those who will have attended the course and subsequently used the training resources (electronic or print) in their teaching/research; those who will have used the training resources in their teaching/research but without having attended the course; those who will have neither attended the course nor used the training resources in their teaching/research; and graduate students who may have been taught or been supervised by individuals in these categories. The assessment to be conducted starting two years after the first course, will consist of two activities: implementation of a comprehensive mail survey (using a questionnaire) to a selected sample of individuals representative of all the above categories; and a workshop with participants representing these categories. The mail survey and workshop will serve as mechanisms to assess the value and impact of the project and how the course and training resources may be improved. The information from both sources will be collected in a way that allows for sound quantitative analysis. However, the workshop will also provide an opportunity to discuss emerging issues more exhaustively.

During the implementation of the project, a comprehensive list of animal breeders/geneticists in sub-Saharan Africa (in universities and research institutes) will be compiled. This will be used as the basis for the sampling described above. At the same time, this list will facilitate a realistic assessment of the coverage ("adoption rate") and impact of the project.

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