

Final Technical Report
**Decision Support for Nutrition Studies in Livestock Research and
Development**
DFID Project Reference No:ZC0289

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FARM-Africa, Kenya
BAIF Development Research Foundation, India
Matopos Research Station, Bulawayo Zimbabwe

Executive Summary:

At the 4th LPP workshop on small stock held in Masaka, Uganda the delegates identified the need to produce an aide memoir for the effective design and execution of experimental projects involving nutritional studies with animals. The essential components of a well conducted study were identified by a sub-group of the collaborators at a workshop held in York, UK during March 2005. Various formats were then developed by the UK team and following consultation with LPP participants in target regions a checklist approach was adopted. This was then drafted and was the subject of further development at the AHAT/BSAS International Conference on 'Integrating livestock-crop systems to meet the challenges of globalisation' held in Thailand in November 2005. Following this the checklist was sent to the collaborators for further refinement. A sixteen-page booklet containing the checklist plus some suggested further reading was produced.

Background:

At the LPP workshops on small stock it became apparent there was a need to improve the effectiveness of nutritional studies designed to support the contribution of small stock to the well-being of resource-poor farmers and communities in the target regions. At the 4th LPP workshop on small stock held in Masaka, Uganda the delegates identified the need to produce a precise and easy-to-use aide memoir.

Project Purpose:

To facilitate effective design and execution of nutrition related studies designed to provide information to benefit discreet groups of landed and landless livestock keepers. The initial beneficiaries were identified as researchers and development workers concerned with designing and executing nutrition studies, including on-station and on-farm trials. The ultimate aim of the checklist (decision making tool) was to enhance the contribution of development studies to the well-being of resource-poor communities in the target regions. The need for such a check list was highlighted by the delegates at the LPP 4th International Small Livestock Workshop, in Masaka, Uganda (15-19 November, 2004). The delegates developed the concept and suggested various potential formats.

Research Activities:

The essential components of a well conducted study were identified by a sub-committee of the participants held in York during March 2005. Attempts were made to produce a truly generic decision tool applicable for development studies; however all drafts were found to be difficult to use and of little value. Thus the decision was made to confine the decision tool to nutrition studies. Various formats were then explored by the UK team and following consultation with LPP participants in target regions, a concise checklist approach was adopted. Investigations of the readily available literature also showed that while there were textbooks on experimental design etc. there was not an easy-to-use and concise checklist specifically designed for development studies. The decision tool (checklist) was then drafted and was the subject of further development at the AHAT/BSAS international conference on '*Integrating livestock-crop systems to meet the challenges of globalisation*' held in Thailand, in November 2005. Following this the checklist was sent to the collaborators for further refinement. A sixteen-page booklet was produced which contained the checklist plus some suggested further reading. The intended outputs were thus achieved.

Outputs:

A decision making checklist for designing appropriate nutrition studies to improve productivity of animals kept by resource-poor livestock keepers was developed, validated and disseminated.

The checklist is designed both for experimentalists and for research managers. In addition to the checklist the document suggests further reference sources. It has purposely been kept short, a feature identified during consultations.

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A copy of the document is appended.

Contribution of Outputs:

The checklist has been produced and distributed particularly to LPP project members.. It will also be placed on the LPP website and offered to other organisations e.g. BSAS, FAO. The decision tool is also to be included in the proceedings of the 5th Link workshop held in Howick, South Africa:

Smith, T., Vatta, A., Buttery, P.J., Owen, E., and Richards, W.I. (eds.). (2006). Making a difference: improving the livelihoods of resource-poor small stock keepers'. Proceedings of an international workshop on "Improving The Well-Being Of Resource-Poor Communities – the contribution of small livestock", Everglades Hotel, Howick, South Africa, 12-15 September 2005. Natural Resources Ltd., Aylesford, Kent. ISBN 0-9552595-5-X.

This decision tool will improve the quality and effectiveness of nutrition related studies designed to improve productivity of animals kept by resource-poor livestock keepers. A check on the effectiveness of the decision tool will be assessed by questioning the recipients of the list later in 2006.

Further opportunities to disseminate the document need to be explored. It would also be useful to explore the possibility of developing similar checklists for other types of studies. a point identified by the collaborators in the target regions. As indicated above attempts were made to produce a truly generic decision tool applicable for all development studies, however, the drafts were found to be difficult to use and of little value. There are at present no funds available to develop this approach.



**A DECISION MAKING
CHECK LIST**
for
**ANIMAL NUTRITION
STUDIES**
in
**LIVESTOCK
DEVELOPMENT**



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INTRODUCTION

This checklist is intended to help researchers at the planning stage of a nutrition experiment/feeding trial with farm livestock, especially ruminants. However the questions asked could be regarded as generic and, therefore, relevant to planning of any experiment with livestock. A group of experienced animal scientists from seven countries met in the UK and in Thailand during 2005 to develop this document.

In planning nutrition-related studies it is important to integrate them with the wider picture. For example how does the study relate to the socio-economic environment of the target region and the intended beneficiaries or how does the proposed outcome of a study with food producing animals relate to human health?

Why a checklist is thought necessary. Research is expensive and must be justified (whether it is part of a national or international programme, it is often carried out using taxpayers' or donors' money and should therefore be accountable). At the outset the need for the experiment must be justified through a literature search and most importantly in development-related research, consultation with likely beneficiaries. The questions asked must be relevant, the experimental design capable of answering the question and a plan of action to disseminate the results to the target audience must be incorporated. Ensure that all the necessary inputs are to hand: all of us have had experience of carrying out trials during which an essential resource, for example forage for the basal diet has run out, or an essential piece of equipment not being available or in working order when needed. The livestock used should be relevant to the question, for example of a suitable breed and stage of development. This checklist should not be treated as a blueprint - rather as a set of questions which could be modified to suit individual circumstances.

All those contributing to an experiment should be aware of the reasons for, and objectives of, the proposed work; they should confirm, either in writing or by signature, that they can meet their obligations. It is also important to remember that a research project is not usually carried out by an individual but by a team. Important groups in the team include those involved in preparing diets, those looking after the animals and those carrying out the routine analyses; they should all be aware that their role is valued and their input encouraged at appropriate times during the planning process. The project leader should visit frequently the field, the field site, the animal house, the laboratory etc. to monitor progress.

Where should the experiment/trial be done? Ideally the location will be as near as possible to that in which the results will be applied (i.e. on-farm). However, where farm sizes and animal numbers are small this can present difficulties. Questions to which the answers are not known are better handled on-station, where there is a greater chance of controlling variation; emergencies can be dealt with and, within reason, losses absorbed. Verification trials, up-scaling and demonstrations should be on-farm whenever possible. When several options are being compared, farmer-practice should be taken into account.

How to use the checklist. Using the checklist should be regarded as an iterative process, in that when you reach a requirement that cannot be met, adjustments must be made to the developing study plan and the check process started again at an appropriate point. The most likely 'sticking points' will be physical resources of livestock, chemicals, transport and labour. Activity charts will help to coordinate the requirements of the study with those of other activities in the research station or the laboratory (e.g. use of digestibility equipment, animal housing); they are simple and effective management tools. Activity charts are also very useful to keep all those involved in the study aware of progress. Before finally getting the plan signed off the checklist should be gone through again from the start. During the study make sure that all concerned are aware of any changes (inevitably changes will be necessary) to the agreed programme. The main point about the use of the check list is to encourage a coordinated and integrated approach to carrying out studies focussing on animal nutrition.

The checklist is appended by a short reading list with notes on content.

We are all privileged to work in research and development; it is both interesting and rewarding. When preparing an experimental plan one of the objectives is to present a convincing case so that appropriate funds and resources can be allocated. Being successful in this as well as achieving the objectives of the proposed study will depend on thorough preparation. That is what this checklist is designed to help with. Finally at the end of each study it is important to critically evaluate it and to use the information and experience gained to refine and develop any future work.



CHECK LIST

1. WHAT IS THE DEMAND FOR THE PROPOSED STUDY?

- a) To answer a hypothesis?
or
- b) To answer an applied problem?
or
- c) To demonstrate an already established concept or procedure in a particular location or environment?
or
- d) Other (but must be defined: e.g. develop a data base of feed composition)?

2. WHAT IS THE BACKGROUND

Has the scientific literature been reviewed?

Has the development literature been reviewed?

Has local information been examined?

Has the work been done before?

If yes, then why do it again? Will repetition confirm an earlier result, add to a further dimension, to prepare for up-scaling, or will a more appropriate location be used?

3. IN THE LIGHT OF 1 AND 2 IS THE PROPOSED STUDY JUSTIFIED?

Are reasons for justification clearly pointed out?

Are the required resources justified in relation to the expected outcomes and benefits of the proposed study?

4. EXPERIMENTAL

Does the main experimental protocol include consideration of:

- location of the study, e.g. on-farm, on-station, dedicated research facility
- number of and type (e.g., breed, sex, age) of animals
- number of treatments and diets, etc.
- an adequate description of the diets including the individual components

- measurements (type and frequency) to be taken during the study
- analyses to be undertaken
- statistical design and will it provide a result with the appropriate amount of confidence, for example are there enough replicates (animals)
- time scale of the project
- presentation and dissemination of the data
- who will undertake each component?

Has the experimental programme been prepared and agreed in writing by all the appropriate parties?

How will the protocol be made available to all involved in the study?

When, how and by whom will the protocol be reviewed during the study?

How will the necessary amendments be made and approved?

5. ETHICS

Have any possible stresses or other ill-effects on the animals been considered?

Does the study conform to local or national legislation?

Have any other ethical aspects been considered, e.g. cultural and religious beliefs, local tradition. etc.?

6. PHYSICAL RESOURCES

Type of animals and source of animals and are they available?

Are the diets available for the whole period of the trial?

Will the labour be available throughout the study?

How will the animals be disposed of at the end of the study? If they are to enter the food chain has it been confirmed that they are fit for human consumption?

Will appropriate power be available throughout the study? If not, does it matter; if it does, where will the backup come from?

Will appropriate water, etc. be available throughout the study?

Is the necessary **transport** available for:

- sourcing the animals
- sourcing the diets
- transporting the staff to undertake the study
- taking the samples to storage
- disposing of the animals
- other requirements?

Is enough **labour** available and does it have the necessary skills for:

- collecting the animals and the diets
- conducting the study including care of the animals
- doing the analyses
- preparing the reports, etc.
- other requirements including recording of the data?

If not, how will the necessary training be undertaken and its effectiveness verified and/or additional appropriately skilled staff be recruited?

Has **collection and storage** of samples been defined including:

- are appropriate storage vessels available
- are appropriate storage facilities available, e.g. reliable refrigeration where required
- is the proposed storage secure, e.g. from vermin?

Analysis of samples:

- have the methods to be used been defined and judged to be appropriate
- have standard operating procedures for the analyses been prepared and defined
- are the necessary skills available, if not where will the training come from
- is the necessary equipment available, in working order and properly calibrated
- are the necessary chemicals of appropriate quality available for the complete study

- has the number of analyses been defined
- has the necessary bulking of samples to reduce the number of analyses been defined including agreement with the statistical advisor
- how will the reliability and precision of the analytical methods be quality controlled?

7. BUDGET

Has this been prepared for the whole study, been reviewed and approved?

Will the funds be released at appropriate times?

Does it include report writing and dissemination?

Is there a budget contingency?

Is the total budget adequate?

Who controls and approves budget changes, etc.?

8. RECORDING OF DATA

Is the method of recording the data secure, e.g. not on scraps of paper?

For each stage of the study how will the data be recorded?

Who is responsible for recording each piece of data?

Where will a backup of the data be maintained?

Has the study been assigned a code for identifying the samples?

Has a permanent labelling mechanism been agreed?

How will the recording of the data be quality controlled?

9. REPORTS

Have the frequency, nature and authorship of interim progress reports been defined?

Have the nature and authorship of the final report been defined?

Who will receive copies?

Where will reports be stored?

10. DISSEMINATION OF RESULTS

To whom will the results be disseminated?

What method will be used for each group?

Who is responsible for each component?

Is the budget for dissemination adequate?

11. TIMETABLE

Has a timetable for the entire study been agreed?

Does it include milestones, e.g. start, mid-term reviews, end dates etc.?

Does it include and define interim goals?

Does it include periodic reviews?

Does it include the date for completing the study?

Does it include a timetable for disseminating individual components of the study?

Flow and activity charts and log frames are useful for establishing timetables.

12. HEALTH AND SAFETY (personnel, environment and animals)

Have all the health and safety issues been considered, including:

- protection of personnel when handling animals
- sourcing of animals
- care of animals
- analysis of samples
- disposal of samples

- disposal of animals
- bio-security of experimental area
- all other components of the study?

This is not an exhaustive list so the whole study should be reviewed, including consideration of local legislation and practices.

13. MANAGEMENT

Has the project leader been agreed and has the person accepted the responsibility?

Has responsibility for each component and the overall study been defined and agreed?

How, when and by whom will progress of the study be monitored relative to the proposed timetable (see 11)?

Have adequate lines of communication for the study been established?

14. EVALUATION

Finally at the end of each study it is important to critically evaluate it and to use the information and experience gained to refine and develop any future work. How will this be achieved?

SHORT READING LIST, WITH NOTES ON CONTENT

Buttery, P., Max, R., Kimambo, A., Ku-Vera, J. and Akbar, A. 2005. Chapter 10. Animal response to nutrient supply. In *Livestock and wealth creation. Improving the husbandry of animals kept by resource-poor people in developing countries* (edited by E. Owen, A. Kitalyi, N. Jayasuriya and T. Smith), pp. 167-189. Natural Resources International Limited, Aylesford, Kent ME20 6SN, UK. (www.nrinternational.co.uk). Published by Nottingham University Press, Thrumpton, Nottingham NG11 0AX, UK. (www.nup.com)

Note: A CD of the book containing this chapter is available from Natural Resources International Limited. The chapter provides the theoretical basis for why animals especially those on a low intake, respond (or not) to nutrient supply.

Conroy, Czech., 2005. *Participatory livestock research. A guide*. Natural Resources Institute of the University of Greenwich, Chatham Maritime, Kent ME4 4TB, UK. (www.nri.org) Published by ITDG Publishing, Bourton-on-Dunsmore, Warwickshire CV23 9QZ, UK. 304 pp. (www.itdgpublishing.org.uk)

Publisher's note: "The book will help researchers and practitioners to overcome the potential difficulties associated with participatory livestock research. Using examples from many different projects around the world the book shows how a participatory approach to technology development can be successful. It also shows how to undertake a needs assessment using participatory approaches, and how to avoid the problems associated with on-farm livestock experiments."

Ewbank, R., Kim-Madslie, F and Hart, C.B. (ed.). 1999. *Management and welfare of farm animals. Fourth Edition*. Universities Federation for Animal Welfare, The Old School, Brewhouse Hill, Wheathampstead, Herts. AL4 8AN, UK. 308 pp. (www.ufaw3.dircon.co.uk)

Publisher's note: "There has, in recent years, been an increase in the intensification of animal production and at the same time, a growing interest taken in extensive, free-range methods of husbandry. This new edition covers these developments. It concentrates on animals commonly found in Europe and describes strategies and techniques used to improve the efficiency of farm animal production as well as giving practical details as to how animals should be kept and cared for. The central theme of the book, however, emphasises the welfare implication of modern husbandry methods, whether they be intensive or extensive."

Givens, D.I., Owen, E., Axford, R.F.E. and Omed, H.M. (ed.). 2000. *Forage evaluation in ruminant nutrition*. CABI Publishing Wallingford, Oxon OX10 8DE, UK. 480 pp. (www.cabi.org)

Publisher's note: "Current pressures to maximise the use of forages in ruminant diets have renewed interest in fast, inexpensive methods for the estimation of their nutritional value. As a result, a wide variety of biological and physiochemical procedures have recently been investigated for this purpose. This book is the single definitive reference volume on the current status of these procedures and their potentials and limitations. It covers the identification of standard procedures appropriate to different regions of the world and technologies and is indispensable reading for researchers and advanced students of animal nutrition and forage crop production."

Grant, I. and Sear, C. (ed.). 1999. *Decision tools for sustainable development*. Natural Resources Institute of the University of Greenwich, Chatham Maritime, Kent ME4 4TB, UK. 267 pp. (www.nri.org)

Note: Some relevant chapters (e.g. Chapter 1. Conducting farmer participatory research: what, when and how. Chapter 7. Hazard analysis critical control point [HACCP]).

Editors' note: "Decision tools for sustainable development brings together up-to-date techniques for collection and management of environmental and socio-economic information. It describes practical decision-making tools for use at all levels from local to international, for rural communities, research services, the food industry and for institutional decision-makers"

ILRI. 2006. *Biometrics and research methods*. International Livestock Research Institute (ILRI), Nairobi, Kenya. (www.ilri.cgiar.org)

Note: A teaching resource (based on GENSTAT) aimed at Teachers of Biometry in Agriculture, with a livestock bias. Available from ILRI, Nairobi, Kenya. To be published June, 2006.

Joint FAO/IAEA Programme. Animal Production and Health Newsletter. 2005. Education to improve the quality of research in developing countries. In *Animal Production and Health Newsletter*, Joint FAO/IAEA Programme, no. 43, December 2005, pp. 9-10.

(www-naweb.iaea.org/nafa/index.html)

Excerpt: "Technical Officer: John Crowther. Identification of the need to improve research in developing countries is being addressed through the development of a web based education package. This modular based package will guide individuals to think and plan more clearly and contains all the aspects of science necessary to perform, analyse, report and promote high quality research. The platform chosen allows the course to be used by distance learning, with continuous remote supervision, assessment and guidance. A number of modules have already been completed and more are being written by experts. It is hoped that the web based system will be completed for peer review by the end of March 2006 and that a fully available programme will be ready by the end of September 2006. See researcher-training.org for developments."

Malmofors, B. Garnsworthy, P. and Grossman, M. 2000. *Writing and presenting scientific papers*. Nottingham University Press, Nottingham, UK. (www.nup.com)

Publisher's note: "This book is designed to benefit young scientists presenting their first research results, experienced scientists wanting to make their communications more effective, university students at all levels, and teachers involved in the training of communication skills. For people who have considerable experience, the book may serve as a reference where they can look up topics for comparison and ideas. For people who have no experience, the book serves as a manual where they can learn the basics of how to write and present science." Contents: Communicating science; sections of a scientific paper; other types of scientific writing; getting started in writing; improving your writing; literature searching and referencing; getting a paper into print; oral presentation and visual displays; poster presentations; training students in writing and presentation; reviewing papers and presentations; index.

Morris, T.R. 1999. *Experimental design and analysis in animal sciences*. CABI Publishing, Wallingford, Oxon OX10 8DE, UK. 208 pp. (www.cabi.org)

Publisher's note: "Many students and even researchers often make the mistake of using too few or too many animals in their experiments which can lead to misleading results or waste of animal resources. This provides one of the several reasons for better training in experimental design. This book has been written with this in mind, and as there is currently no book that provides user-friendly guidance on the design and analysis of experiments in the animal sciences. While many textbooks on statistics exist, these do not enable students to judge which tool might be appropriate in particular circumstances. By drawing on examples from animal experiments to illustrate general principles and thus making the learning process easier for those beginning research into animal science and production, this book aims to fill a gap in the literature. It is an essential textbook for advanced undergraduate and graduate students in animal science."

Owen, E., Kitalyi, A., Jayasuriya, N. and Smith, T. (ed.). 2005. *Livestock and wealth creation. Improving the husbandry of animals kept by resource-poor people in developing countries*. Natural Resources International Limited, Aylesford, Kent ME20 6SN, UK. (www.nrinternational.co.uk). Published by Nottingham University Press, Nottingham, UK. (www.nup.com)

Note: A CD of this book is available from Natural Resources International Limited. The textbook is aimed principally at lecturers and students of animal science concerned with livestock development. Chapters 1-13 (Part 1) deal with cross-cutting issues (why keep livestock if you are poor, livestock systems, poverty assessment methods, livestock development and poverty, knowledge key to empowerment, livestock products and improvement, livestock and the environment, response to nutrient supply, feeds and feeding to improve productivity, sustainable breeding strategies and improving livestock health). Chapters 14-26 (Part 2) consider species individually (bees, Giant African snails, poultry, small mammals [grasscutters, guinea pigs and rabbits], pigs, goats, sheep, camels, cattle, buffalo, yak, equines and wildlife). The book concludes with a chapter considering the lessons learned and the way ahead.

Savitri, Abeyasekera, University of Reading, Statistical Services Centre and Natural Resources Institute. 2001. *Analysis approaches in participatory work involving ranks and scores*. (Revised August 2001) 16 pp. Harry Pitt Building, The University of Reading, PO Box 240, Reading RG6 6FN, UK.

Smith, T., Jayasuriya, N., Mlambo, V., Lekule, F., Thomas, D., Owen, E., Pearson, A. and Titterton, M. 2005. Chapter 11. Feeds and feeding to improve productivity and survival. In *Livestock and wealth creation. Improving the husbandry of animals kept by resource-poor people in developing countries* (edited by E.Owen, A. Kitalyi, N. Jayasuriya and T. Smith), pp. 191-213. Natural Resources International Limited, Aylesford, Kent ME20 6SN, UK. (www.nrinternational.co.uk). Published by Nottingham University Press, Nottingham, UK. (www.nup.com)

Note: A CD of the book containing this chapter is available from Natural Resources International Limited. The chapter considers the feeds available to smallholder farmers in developing countries, and the constraints imposed on livestock production through limitations of feed supply and nutritional value.

Publications from The University of Reading, Statistical Services Centre, Biometrics Advisory and Support Services to DFID.

a)1998. *On-farm trials - some biometric guidelines*. March 1998. 14 pp. Harry Pitt Building, The University of Reading, P.O. Box 240, Reading RG6 6FN, UK.

b)1998. *Guidelines for planning effective surveys*. March 1998. 14 pp. Harry Pitt Building, The University of Reading, P.O. Box 240, Reading RG6 6FN, UK.

c) 1998. *Data management guidelines for experimental projects*. March 1998. 15 pp. Harry Pitt Building, The University of Reading, P.O. Box 240, Reading RG6 6FN, UK.

The above list is only a selection of what is available and is for illustrative purposes.



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