

International Livestock Research Institute

Training course report

Global burden of animal diseases Ethiopia case study: Animal health economics
second-round training

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Acknowledgements

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Introduction

On 18–20 April 2022, Work Package 6 (capacity building) of the Global Burden of Animal Diseases (GBADs) Ethiopia case study conducted a second round of training on animal health economics to build the capacity of government stakeholders. The training was given to the same cohort that participated in the first training course held on 28–30 June 2021 which provided a basic introduction to animal health economics to relevant staff in Ethiopia's central veterinary and livestock production services. The training was also aimed at improving awareness and competence in the use of animal health economics and familiarizing the participants and their organizations with future GBADs tools and approaches.

The second training course was held at the Addis Ababa campus of the International Livestock Research Institute (ILRI). The aim was to convey the basics of economics and its use in animal health decision-making to veterinarians, animal production experts, animal health decision-makers and epidemiologists.

Livestock are extremely important in Ethiopia for economic development and poverty reduction. Ethiopia has one of the largest livestock inventories in Africa, supporting the livelihoods of an estimated 80% of rural poor. However, the economic benefit derived from the livestock sector is not commensurate with the economic potential, and the sub-sector remains untapped. One of the major constraints is the wide range of livestock diseases prevalent in the country. Ethiopia is endemic to a number of livestock diseases, causing a high degree of mortality and morbidity and posing significant economic, food security, livelihood and public health impacts.

During the GBADs inception workshop held on 18 March 2021, key stakeholders noted that the country lacks a system to determine the economic burden of these diseases in the various sectors and farming systems (pastoral, mixed systems, specialized smallholder and commercial farms). As a result, policymakers lack the required data to make informed decisions on investment in the livestock sector. Moreover, animal health practitioners and researchers often have difficulty in appropriately communicating evidence from their work to policymakers on safeguarding livelihoods, food security, economic growth and public health.

The key to successful resource mobilization would be the incorporation of substantive economic evidence and the rationale for such investment. Government or private sector managers in the financial and planning realm need these to better understand the threats and make the case for further and adequate investment in protecting animal health.

Therefore, it has become increasingly important to provide sound economic justification for any proposed action to improve or safeguard animal health to those expected to finance these interventions. Such economic evaluations assist in setting priorities and deciding where to allocate resources when there are competing interventions and limited resources.

Objectives of the training course

- To evaluate economic returns of animal health interventions
 - At different levels of intervention (farm, national and global)
 - For different class of diseases (endemic, sporadic and zoonotic)
- To apply a value chain approach to disease risk management
- To effectively present animal health economics evidence for decision-makers

Course content

Each session included a tutorial/lecture (1.5 hours) and a practical (1.5 hours). The training focused on basics with demonstrations of approaches to develop initial understanding.

Day 1

Economic analysis tools for evaluation of animal health interventions

Economic assessment of short-term changes: Gross margin analysis and partial budget analysis

- Gross margin analysis
 - Variable cost vs. fixed costs
 - Application of gross margin analysis to assess enterprise profitability
 - General format for calculating the gross margin: An example of a livestock farm
 - Exercise on calculating the gross margin for beef fattening
- Partial budget analysis
 - Describe the situations where partial budget is applicable
 - General format for partial budget. Additional returns, reduced costs, returns forgone and extra costs
 - Exercise: Performing partial budgeting for a sheep farm
- Pay off table/decision tree analysis
 - Situations where pay off table is used: When there are uncertainties in occurrence of the disease during the planning period
 - General format for pay off table
 - Exercise: Performing pay off table analysis for a feedlot
- Decision tree analysis
 - Purpose of decision tree analysis (alternative to pay off table and used for the same purpose)
 - When to use decision tree analysis (when sequence decision is to be made)
 - Demonstrating the organization of a decision tree chart (decision nodes, chance nodes and end nodes)
 - Exercise: Decision tree analysis for alternative tick control strategies [taken from Rushton (2009)]

Economic assessment of long-term changes: Discounting and cost benefit analysis

- Cost benefit analysis
 - Some economic concepts relevant for cost benefit analysis: Time value of money, compounding and discounting, inflation and real discount rate, opportunity cost and shadow prices, depreciation
 - Procedures in cost benefit analysis
 - The three decision criteria/measures: net present value, benefit cost ratio and internal rate of return
 - Advantages and disadvantages of the three decision criteria
 - Exercise: Calculating depreciation
 - Exercise: Calculating cost benefit analysis for alternative disease eradication projects
 - Financial feasibilities (viabilities)
 - Uncertainty and sensitivity analysis
 - Use of Monte Carlo simulation: Use of random numbers and probability to represent uncertainties, how Monte Carlo simulation works, steps in Monte Carlo simulation, example of Monte Carlo simulation
 - Frequently used distributions in stochastic analysis: uniform, Poisson, exponential, normal, triangular, pert, binomial
 - Examples on application of the various distributions
 - Correlation in Monte Carlo simulation

Day 2

Economic assessment of long-term changes for zoonotic diseases: Introduction to cost-effectiveness analysis

- Components/steps of cost-effectiveness analysis: Enumerating options, choosing the perspective, delineation of time horizon and discounting, measuring and valuing costs, measuring and valuing outcomes, handling uncertainties.
- Different variants of cost-effectiveness analysis: Cost minimization analysis, cost-effectiveness analysis and cost utility analysis.
- The use of health-adjusted years in cost utility analysis, expressed as quality-adjusted life year (QALY) or disability-adjusted life year (DALY).
- Examples of and exercises with QALY and DALY
- Other issues with DALY calculation: Discounting, age weighting and social weighting

Quantifying risk and uncertainty and how they relate to epidemiological and economical tools (e.g. sensitivity analysis, decision tree analysis)

- A study by Knight-Jones (2010) on the effectiveness of wild waterbird surveillance for avian influenza was presented to the trainees.
 - The study aimed at assessing which method of wild waterbird surveillance had the greatest probability of detecting highly pathogenic avian influenza H5N1. The study was conducted around Lake Constance in Europe.
 - Surveillance consisted of testing birds sampled by different methods: dead birds found by the public, live birds caught in traps, swans (*Cygnus olor*) caught during the moulting period, birds caught in fishing nets, birds shot by hunters, mallard (*Anas platyrhynchos*) sentinel flocks.
 - Scenario tree analysis was performed, including sensitivity analysis, followed by assessment of cost-effectiveness.
 - Trainees were shown how scenario tree analysis was used to estimate and compare the sensitivity of the different methods of sampling wild birds, identify important parameters that influence sensitivity and measure the cost-effectiveness of the different sampling methods.
- What-if analysis
- Breakeven analysis with data and examples on foot-and-mouth disease from Nepal and Tanzania
- Statistical confidence intervals
- Monte Carlo simulation modelling
- Exercise on breakeven analysis

Day 3

Value chain approach to animal disease risk management

- Why do we need a value chain approach for management of animal disease risks?
 - Risk-based, people-centred control of disease risks in livestock value chains
 - Value chains and value chain analysis for management of animal disease risks
 - What are value chains?
 - Examples of value chain maps for Ethiopia live animal and dairy sectors
 - Value chain analysis
 - Risk analysis
 - Key concepts and principles: hazard identification, risk assessment, risk management and risk communication
 - Practical framework in using a value chain approach for livestock disease management
- Step 1: Situation analysis and preliminary risk analysis**
- Describe the epidemiology of the situation regarding the disease(s) of concern.
 - Describe the livestock value chains and identify the people and organizations involved in them.
 - Identify and characterize the risk issues and risk hotspots in value chains.
 - Organize information into tables to describe areas of risk (risk issues).
 - Carry out a preliminary assessment of areas within the value chains that should be prioritized as risk hotspots.

Step 2: Detailed risk and value chain analysis leading to planning of risk management options

- Develop risk pathways and identify potential risk mitigation measures.
- Develop options for inclusion in a risk management strategy.

Step 3: Option appraisal and decision-making

- Analyze impacts on different stakeholders.

Presentation and communication of economic evaluations evidence for policymakers

- Challenges to effective communication
 - Weak research–policy interface: Effective science communication is key
 - Other communication challenges include diverse culture, varied needs, mixed opinions, clustered socio-economic strata, education and lack of access to information
 - Inability to simplify technical research findings (jargon)
 - Scientists' attitudes and mindsets: Communication is an afterthought
- Rules for effective science communication
 - Effective communication must be planned; this entails the 'Why, Who, What, When and Where (5Ws) and How' and the development of SMART [specific, measurable, attainable, realistic, time-bound] communication goals.
 - Build trust and credibility. Knowledge does not equate to trust; people want to know that you care before they care about what you know.
 - Understand the gap. A relevant message develops trust and acceptance.
- Developing responsive messages
 - The headline should be catchy. Entice the readers or listeners to decide whether to devote more of their time.
 - The key message includes the headline and three supporting facts.
- Message content checklist
 - Accuracy: The message is clearly and accurately delivered and received. Avoid misunderstandings and misinterpretations.
 - Transparency: Acknowledge study limitations
 - Relevant and up-to-date content
- Engaging policymakers: Tools and tips
 - Formal and informal meetings with selected parliamentary committees
 - Populate parliament library with project frequently asked questions, infographics etc.
 - Identify with parliamentary and cabinet staff
 - Pair researches with champion policymakers and journalists
- Policy briefs
 - Synthesize existing research knowledge on a policy or practice issue of importance
 - Punchy topic
 - Should be persuasive and convincing
 - Accurate and evidence-based
 - Include visuals such as charts and graphs
 - Focus on a single topic
 - Style: Maximum of 1500 words
 - Structure: First page with logo, statistics, photos, quotes etc.
 - Coherent conclusions, implications and recommendations
- Exercise on preparation of key messages for policymakers (headlines and three supporting facts)

More practical exercises on economic evaluation tools discussed in the preceding sessions

- Exercise on decision tree analysis
- Trainees guided to download @Risk software and provided with decision tree software

Summary of training evaluation

Trainers: Wudu Temesgen, Theo Knight-Jones, Bibiana Iraki and Wondwosen Asfaw

Instructions: Please tick your level of agreement with the statements below	Strongly agree	Agree	Disagree	Strongly disagree	Not relevant to this event
1. The objectives of the training were met	9				
2. The presenters were engaging	8	1			
3. The presentation materials were relevant	8	1			
4. The content of the course was organized and easy to follow	7	2			
5. The trainers were well prepared and able to answer any questions	6	3			
6. The course length was appropriate	1	5	3		
7. The pace of the course was appropriate to the content and attendees	4	5			
8. The exercises/role play were helpful and relevant	6	3			
9. The venue was appropriate	6	3			

10. What was most useful?

- The training was good with lectures accompanied by exercises
- All aspects of the training were equally relevant
- The time allocated was short; however, the presenters tried a lot to pass the information in the time allotted
- The course gives some clue on how to quantify the cost and benefits of given control or prevention strategies
- The aspects related to cost benefit analysis, value chain approach to disease risk management, and communication strategy for policymakers were most useful
- The aspects on animal health economics and risk analysis were most useful

11. What was least useful?

- All presentations and topics were useful and interesting
- Nothing
- It is better to extend the training days for better dissemination of the knowledge and skills

12. What else would you like to see included in this event? Are there any other topics that you would like to be trained on?

- The topics are OK; however, the time is too short
- Include in the training the experience of other countries
- The training could have been more useful if it was given with adequate time. More time could have been allocated to exercises.
- Software and other statistical tools should be discussed (the restricted time allocation may have prevented the presenters from dwelling on the software)
- Equip the professionals in the Ministry of Agriculture on data analysis and presentation including manuscript preparation

13. Would you recommend this course to colleagues? Yes/No and why?

- Yes, I recommend. Because it is most relevant and applicable in every sector specifically in agriculture.
- Yes, I recommend this course to be given to colleagues. We professionals from veterinary and animal health background lack the economic aspects of health for decision-making.
- Yes, it is particularly useful in my field of speciality. I know they will benefit a lot as I have benefited.
- Yes, it is very important for professionals working in the livestock sector especially at the national level.
- Yes, it is very essential to others.

14. Any other comments?

- We appreciate ILRI GBADs for organizing this important training which is very applicable and helpful for our daily activity.
- The trainers were all well-organized, aside from the time issue. I would thank all the presenters for their nice presentations.
- It would have been better if the training time were extended for some weeks and the training material sent prior to the training.
- Please give more training days (at least five days).

List of trainees

Name	Designation	Institution
Mr Yimer Gobena	Vector and vector-borne disease expert and focal person for the national peste des petits ruminants eradication and control program	Disease Prevention and Control Directorate, Ministry of Agriculture
Dr Gashaw Beyene	Senior veterinary officer and OIE national focal point for disease notification	Epidemiology Directorate, Ministry of Agriculture
Dr Roba Jilo	Specialist veterinarian	Public Health Directorate, Ministry of Agriculture
Dr Asayegn Bekele	Senior quarantine expert	Quarantine Import–Export Inspection and Certification Directorate, Ministry of Agriculture
Mr Bayeta Senbeta	Associate researcher	National Animal Health Diagnostic and Investigation Centre
Ms Almas Araya	Poultry production extension expert	Poultry Production Directorate, Ministry of Agriculture
Ms Mihret Frew	Dairy development expert	Dairy Production Directorate, Ministry of Agriculture
Mr Fekede Melaku		Meat, Hide and Skin Directorate, Ministry of Agriculture
Dr Markos Tadele Mulatu	Animal health researcher	Ethiopian Institute of Agricultural Research

Total number of trainees: 9

Program

Time	Session	Responsible
Day 1		
0830–0900	Registration of participants	ILRI GBADs team
0900–0905	Introduction of participants	Participants
0905–0910	Training objective and program	ILRI GBADs team
0910–1030	Economic analysis tools for evaluation of animal health interventions Economic assessment of short-term changes: Gross margin analysis, partial budget analysis)	Wudu Temesgen
1030–1100	Health break	
1100–1230	Group work and discussions	Wudu Temesgen
1230–1330	Lunch break	
1330–1530	Economic assessment of long-term changes: Discounting and cost benefit analysis	Wudu Temesgen
1530–1600	Health break	
1600–1730	Group work and discussions	Wudu Temesgen
Day 2		
0900–0945	Economic assessment of long-term changes for zoonotic diseases: Introduction to cost effectiveness analysis	Theo Knight-Jones
0945–1030	Quantifying risk and uncertainty, and how they relate to epidemiological and economical tools (e.g. sensitivity analysis, decision tree analysis)	Theo Knight-Jones
1030–1100	Health break	
1100–1230	Group work and discussions	Theo Knight-Jones
1230–1330	Lunch break	
1330–1530	Cost-effectiveness and quantifying risk and uncertainty uncovered parts	Wudu Temesgen
1530–1600	Health break	
1600–1730	Group work and discussions	Wudu Temesgen
Day 3		
0900–1000	Value chain approach to disease risk management	Wondwosen Asfaw
1000–1030	Group work and discussions	Wondwosen Asfaw
1030–1100	Health break	
1100–1200	Presentation and communication of economic evaluations for policymakers	Bibiana Iraki
1200–1230	Discussion	Bibiana Iraki
1230–1330	Lunch break	
1330–1530	More practical exercises of economic evaluation tools discussed in the preceding sessions	ILRI GBADs team
1530–1600	Health break	
1600–1730	General discussion and wrap up	Participants