

The image features a woman in a white tank top and a man in a turban and shawl with a cow in the foreground, set against a background of a herd of cattle. The woman is smiling and looking to the left. The man is looking towards the camera. The cow is in the foreground, looking towards the camera. The background shows a herd of cattle in a field.

The Role of Livestock in Developing Communities:

Enhancing Multifunctionality

Frans Swanepoel
Aldo Stroebel
Siboniso Moyo

The Role of Livestock in Developing Communities: Enhancing Multifunctionality

**Frans Swanepoel, Aldo Stroebel
and Siboniso Moyo**

The Role of Livestock in Developing Communities:
Enhancing Multifunctionality

Co-published by The Technical Centre for Agricultural and Rural Cooperation (CTA)

All rights reserved

Copyright © 2010 UFS and CTA

No part of this book may be reproduced or transmitted in any form or by any electronic, photographic or mechanical means, including photocopying and recording on record, tape or laser disk, on microfilm, via the Internet, by E-mail, or by any other information storage and retrieval system, without prior written permission from the publisher.

First Edition 2010

ISBN: 978-0-86886-798-4

Cover, page layout and design by SUN MeDIA Bloemfontein
Designed in Adobe Photoshop and Indesign CS4

Produced by SUN MeDIA Bloemfontein
59 Brill Street, Westdene, Bloemfontein, South Africa, 9301
www.africansunmedia.co.za/
www.sun-e-shop.co.za

Photograph plates sourced from the ILRI Collection on www.flickr.com/photos/ilri/sets/

About CTA

The Technical Centre for Agricultural and Rural Cooperation (CTA) was established in 1983 under the Lomé Convention between the ACP (African, Caribbean and Pacific) Group of States and the European Union Member States. Since 2000, it has operated within the framework of the ACP-EU Cotonou Agreement. CTA's tasks are to develop and provide products and services that improve access to information for agricultural and rural development, and to strengthen the capacity of ACP countries to acquire, process, produce and disseminate information in this area.

CTA is financed by the European Union.

CTA
Postbus 380
6700 AJ Wageningen
The Netherlands
www.cta.int



partageons les connaissances au profit des communautés rurales
sharing knowledge, improving rural livelihoods



UNIVERSITY OF THE FREE STATE

ILRI
INTERNATIONAL
LIVESTOCK RESEARCH
INSTITUTE

Contents

List of Tables	iii
List of Figures	v
List of Boxes	vii
Biographies of Editors	ix
Editorial Advisory Committee	xi
Editorial Assistance	xi
Acknowledgements and Peer-Review Process	xii
Preface	xiii
Foreword	xv
1. Multifunctionality of Livestock in Developing Communities	1
<i>S. Moyo and F.J.C. Swanepoel</i>	
2. Livestock Development Projects that Make a Difference: What Works, What Doesn't and Why	13
<i>A.N. Pell, A. Stroebele and P. Kristjanson</i>	
3. Promoting Gender Equality and Empowering Women through Livestock	31
<i>A. Waters-Bayer and B. Letty</i>	
4. The Way Forward for Livestock and the Environment	51
<i>M. Herrero, P. K. Thornton, P. Gerber, A. van der Zijpp, J. van de Steeg, A. M. Notenbaert, P. Lecomte, S. Tarawali and D. Grace</i>	
5. The Role of Foods of Animal Origin in Human Nutrition and Health	77
<i>L. Ndlovu</i>	
6. Interactions between Gender, Environment, Livelihoods, Food, Nutrition and Health	93
<i>E.A. Nesamvuni, F.J.C. Swanepoel and A. Stroebele</i>	

7. Livestock against Risk and Vulnerability: Multifunctionality of Livestock Keeping in Burundi	107
<i>E. Vandamme, M. D'Haese, S. Speelman and L. D'Haese</i>	
8. Sustainable Livestock Intensification	123
<i>A. van der Zijpp, P. Wilke and S. Carsan</i>	
9. Value Chains and Innovation	151
<i>J. McDermott, K. Rich, B. Gebremedhin and H. Burrow</i>	
10. Implications and Innovative Strategies for Enhancing the Future Contribution of Livestock	171
<i>C.Devendra, F.J.C. Swanepoel, A. Stroebel and C.J. van Rooyen</i>	
Biographies of Authors	193
Index	203
Plates	207

List of Tables

Chapter 2

Table 1	16
<i>A summary of benefits and products derived from livestock</i>	

Chapter 4

Table 1	67
<i>Potential for carbon sequestration (Tg C/yr) in global rangelands of different overgrazing severity, by continent</i>	

Chapter 5

Table 1	80
<i>Approximate nutrient composition of some animal source foods per 100 g</i>	
Table 2	82
<i>Adequacy (%) of intake of nutrients by school-age children in Egypt, Kenya and Mexico</i>	
Table 3	82
<i>Composition of selected plant source and animal source foods in relation to nutrient requirements of school-age children</i>	

Chapter 7

Table 1	113
<i>Livelihood activities of households (hh) with different food security status in Ngozi, 2007</i>	
Table 2	114
<i>Characteristics of livestock keeping in Ngozi, 2007</i>	
Table 3	114
<i>Animal production in Ngozi, 2007</i>	
Table 4	116
<i>Access to credit for households involved in different livestock keeping strategies in Ngozi, 2007</i>	
Table 5	117
<i>Farm management decisions of households with different livestock keeping strategies in Ngozi, 2007</i>	
Table 6	118
<i>Involvement in livelihood activities of households with different livestock keeping strategies in Ngozi, 2007</i>	

Chapter 8

<i>Table 1</i>	126
<i>Protein supply from livestock & all sources in 1980 and 2002</i>	
<i>Table 2</i>	130
<i>Global livestock population in different production systems (Averages 2001 to 2003)</i>	
<i>Table 3</i>	135
<i>Feed conversion for main species and world regions</i>	

Chapter 9

<i>Table 1</i>	162
<i>Comparison of value chain components, linkages and areas for future development among three different African value chains</i>	

Chapter 10

<i>Table 1</i>	180
<i>Summary of livestock systems, priority production systems and major issues</i>	
<i>Table 2</i>	185
<i>Effects of climate change on land use and livelihood systems of the poor</i>	

List of Figures

Chapter 4

<i>Figure 1</i>	55
<i>Crop farming to keeping livestock: Livelihood transitions to 2050 in Africa due to climate change</i>	
<i>Figure 2</i>	57
<i>Predicted deforestation hotspots in South America 2000-2010</i>	
<i>Figure 3</i>	59
<i>Estimated contribution of livestock to total P_2O_5 supply on agricultural land, in area presenting a P_2O_5 mass balance of more than 10 kg per hectare. Selected Asian countries - 1998 to 2000</i>	

Figure 4	62
<i>Livestock water productivity in the Nile Basin expressed as (a) the ratio of milk production and depleted water, (b) ratio of meat production and depleted water, and (c) the ratio of summed value of produced meat and milk, and the water depleted to produce the required livestock feed. (Water for residues is not included in the calculation of depleted water)</i>	
Figure 5	65
<i>The effect of concentrate supplementation on milk production and the efficiency of methane production in a 500kg cow consuming a basal diet of Brachiaria spp.</i>	
Figure 6	66
<i>Effects of diet quality on milk production and herd size to reach a methane emissions quota of 1 tonne</i>	
 Chapter 5	
Figure 1	79
<i>Theoretical causal linkages between animal ownership and health and nutrition outcomes among the poor</i>	
 Chapter 6	
Figure 1	95
<i>Evolution of the Livestock Production Index (1999-2001 = 100) in selected countries (1980-2004)</i>	
Figure 2	98
<i>Schematic representation of policy view points</i>	
 Chapter 7	
Figure 1	113
<i>Food security status of households in Ngozi in 2007</i>	
Figure 2	115
<i>Distribution of different livestock keeping strategies of households in Ngozi, 2007</i>	
 Chapter 8	
Figure 1	127
<i>Domestic consumption and exports of high value products in developing countries are growing rapidly</i>	

Chapter 9

<i>Figure 1</i>	154
<i>A detailed generic value chain for beef</i>	

List of Boxes

Chapter 2

<i>Box 1 Vaccine development research</i>	17
<i>Box 2 Improving the management of trypanocide resistance in West Africa</i>	18
<i>Box 3 Enhancing livelihoods of livestock-dependent poor people through increasing use of fodder in India and Nigeria</i>	21
<i>Box 4 Three-strata forage system (TSFS) in Bali, Indonesia</i>	22
<i>Box 5 Better policy and management options for pastoral lands: Assessing the trade-offs between poverty alleviation and wildlife conservation</i>	23

Chapter 3

<i>Box 1 Examples of innovation by women livestock keepers in South Africa</i>	38
<i>Box 2 Important contribution by pastoral dairywomen to family income</i>	40
<i>Box 3 Loss of livestock income and assets because of inability to decide</i>	41

Chapter 4

<i>Box 1 Farming crops to keeping livestock: Livelihood transitions due to climate change</i>	54
<i>Box 2 Livestock water productivity in the Nile Basin</i>	61
<i>Box 3 Mitigating methane emissions of livestock: the role of diet intensification</i>	65

Chapter 5:

<i>Box 1 Intervention project to study impact of foods from animal origin on micronutrient deficiencies in school children in Embu District, Kenya</i>	83
<i>Box 2 The impact of semi-scavenging poultry production on the consumption of foods from animal origin by women and girls in Bangladesh</i>	88

Chapter 8:

Box 1 Ruminants and monogastric production in different livestock systems..... 131
Box 2 Integration of oil palm-ruminant systems..... 132
*Box 3 Sources of livestock system pressure on the environment and
recommended remedial policies..... 140*

Chapter 9:

Box 1 South Africa beef value chain: linking emerging farmers to markets 159
Box 2 Ethiopia beef – efforts to improve domestic and export value chains..... 160
Box 3 Ethiopia smallholder dairy development in peri-urban zones 161

Biographies of Editors

Frans Swanepoel is Senior Director Research Development and Professor of Sustainable Agriculture at the University of the Free State, South Africa. He holds a PhD in Animal Breeding. Previously he was Dean of Agriculture at the University of Fort Hare, South Africa, where he is now an Adjunct Professor. He served as Deputy Chairperson of the South African Agricultural Research Council for ten years. During 2008/2009, he was a Fulbright Visiting Fellow at the Cornell International Institute for Food, Agriculture and Development at Cornell University, USA. He is currently directing a major WK Kellogg Foundation-supported initiative to revise agricultural education and training in Africa. He has successfully supervised more than 20 Masters and Doctoral students, and is the author/ co-author of more than 150 journal articles, monographs, reports and book chapters. His fields of specialisation include smallholder livestock production systems, agricultural research and innovation management, rural development and institutional strengthening.

Aldo Stroebel is Director International Affairs, and affiliated as Associate Professor at the Centre for Sustainable Agriculture and Rural Development, at the University of the Free State, Bloemfontein, South Africa. He is currently on secondment to the Vice-Chancellor's Office directing international academic projects. He holds a Master's degree in International Agricultural Development from the University of Ghent, Belgium, and a PhD in Sustainable Agriculture from the University of the Free State. He completed graduate course work as part of his PhD programme at Cornell University in the USA. He has successfully supervised more than 15 Masters and Doctoral students, and is the author/co-author of more than 80 journal articles and publications. He has extensive international experience, including as a non-EU evaluator of the EU's Leadership Plus Programme, and as consultant to the FAO, LuxAid, the World Bank and the WK Kellogg Foundation. He serves on a number of boards and committees, including as Conference President of the International Network of Research Management Societies (INORMS), and on the Board of the South Africa Netherlands Partnership Programme on Alternatives in Development (SANPAD). His fields of specialisation include rural development, human capital development and capacity building, and smallholder farming systems.

Siboniso Moyo is the Regional Representative of the International Livestock Research Institute (ILRI) in southern Africa, based in Maputo, Mozambique. She obtained an MSc in animal husbandry (Zootechnica) from the Patrice Lumumba University in Moscow in 1984, and a PhD in Animal Science (Breeding) from the University of Pretoria in 1997. In the same year, she became a Fellow under a three year Rockefeller Foundation Fellowship on Initiative for Development and Equity in African Agriculture (IDEAA). Before her current position, she conducted livestock research in Zimbabwe and the region for 21 years. She has mentored a number of young researchers and students in her different leadership roles as head of the Matopos Livestock Research Station in Zimbabwe (1997-2002) and as a National Director for Livestock Production and Development in the Ministry of Agriculture, Zimbabwe (2002-2006). Since 2008, she is a Mentor under the programme for African Women in Agricultural Research and Development (AWARD), facilitated by the CGIAR Gender and Diversity Programme. Her fields of specialisation include breed performance evaluation, smallholder livestock-production systems, livestock research and management, and partnership development.

Editorial Advisory Committee

- ▶ Dr Canagasaby Devendra, formerly ILRI and tropical animal production specialist, Malaysia
- ▶ Dr John McDermott, DDG Research, ILRI and Visiting Professor, University of Guelph, Canada
- ▶ Prof Akke van der Zijpp, Professor in Livestock Production Systems, Wageningen University and Research Centre, The Netherlands

Editorial Assistance

- ▶ Ms Nancy Hart, Rome, Italy
- ▶ Ms Claudine Macaskill, University of the Free State, South Africa
- ▶ Mr Hendrik Swanepoel, Murdoch University, Australia
- ▶ Dr Glen Taylor, University of the Free State, South Africa
- ▶ Mr Kevin Whitfield, University of the Free State, South Africa

Acknowledgements and Peer-Review Process

- ▶ The Editors would like to acknowledge the valuable support and contribution from all the participants in the Satellite Symposium, as well as from the World Conference on Animal Production (WCAP)(2008) Organising Committee, in particular the Conference President, Prof Norman Casey of the University of Pretoria, South Africa.
- ▶ The Editors are greatly indebted to the support and input of the Editorial Advisory Committee, as well as the editorial assistants.
- ▶ Special mention has to be made of Dr Devendra (Malaysia), who has travelled to South Africa three times in the process of finalising this book, and who has reviewed and enriched every chapter.
- ▶ The Satellite Symposium, and eventually the publication of this book, would not have been possible without the generous financial and in-kind support from:
 - ♦ Australian Centre for International Agricultural Research (ACIAR), and in particular Dr Simon Hearn;
 - ♦ University of the Free State, South Africa;
 - ♦ International Livestock Research Institute (ILRI);
 - ♦ Cornell University, USA;
 - ♦ National Research Foundation (NRF), South Africa;
 - ♦ World Association of Animal Production (WAAP); and
 - ♦ CTA Wageningen, The Netherlands

The chapters in this book have been reviewed by persons chosen for their diverse perspectives and technical expertise in accordance with procedures required by the Department of Higher Education and Training (South Africa) and CTA Wageningen as co-publisher. In order to maintain and ensure the highest quality, a two-stage review process was followed: each chapter was independently blind-reviewed by at least two acknowledged experts to provide candid and critical comments to improve the chapters and ensure scientific soundness, and to warrant international expectations of objectivity, evidence and responsiveness.

Preface

This book is the product of a Satellite Symposium on the Role of Livestock in Developing Communities: Enhancing Multifunctionality, held as part of the 10th World Conference on Animal Production (WCAP) in Cape Town, 22 – 28 November 2008. The Symposium, jointly organised by the University of the Free State (UFS) and the International Livestock Research Institute (ILRI) aimed to stimulate critical thinking on the role of livestock in livelihood strategies for the poor in the developing world as a contribution to address the Millennium Development Goals (MDGs).

The livestock sector in developing countries contributes more than 33% to agricultural Gross Domestic Product (GDP), and is one of the fastest growing agricultural sub-sectors. The livestock sector has been experiencing what has been coined the “Livestock Revolution”. Population growth, urbanisation, and most importantly, increasing income have resulted in a rapid increase in demand for livestock products, which is likely to continue well into the future. This growth of the livestock sector presents both enormous opportunities and challenges. This book therefore comes at an opportune time for both policy makers and practitioners in developing countries, and the international community. Livestock is a major contributor to food and nutritional security, and serves as an important source of livelihood for nearly 1 billion poor people in developing countries. Its importance in attaining the MDGs should therefore not be underestimated.

The book aims to provide critical information and knowledge on the importance of livestock in the global effort to alleviate poverty and promote human health. It describes and evaluates case studies, examines theoretical frameworks, and discusses key global policy development issues, challenges and constraints related to smallholder livestock-production systems around the globe. The book is written for academic professionals, industry experts, government officials and other scholars interested in the facts and issues concerning the contribution of livestock to the social and economic progress of developing countries.

The introductory chapter is followed by a chapter outlining a conceptual framework for the role and contribution of livestock in the livelihoods of developing communities. In the subsequent three chapters, cross-cutting themes are addressed, namely promoting gender equality and empowering women through livestock, livestock-environment interactions, and food, nutrition and health systems focusing on food from animal origin. Thereafter a chapter analysing the interactions between these three components follows. Subsequent chapters address the role of livestock against risk and vulnerability in smallholder communities, sustainable intensification and value chains and innovation in smallholder production systems. The book is

concluded with a chapter on implications and innovative strategies for enhancing the future contribution of livestock to developing communities. All the chapters are well illustrated with case studies from developing countries, focusing on Sub-Saharan Africa, South Asia and Latin-America. We are confident that the book will assist in generating renewed interest in the livestock sector.

Foreword

Animal agriculture is the most widespread use of the world's land surface. In many areas it is the only means of producing food from inedible vegetation. In almost all farming systems it is essential for converting inedible by-products and waste materials into food and hence it is no coincidence that as crop production intensifies so too does livestock production. For most of the 2.6 billion people depending on smallholder farming systems livestock production is essential for diversifying income sources and maintaining soil fertility and providing draught power and transportation. This is particularly important to women for whom the value adding activities in processing and marketing products such as eggs, butter, cheese, leather goods and wool and woven products make vital contributions to their household budgets. The options for landless production provided by livestock are critical to the livelihoods of millions especially in urban and peri-urban communities. Possibly most important of all is the contribution that animal-source foods make, not just to children's growth and health, but also to their cognitive development. Healthy and bright children in the classroom are the wellspring of national development.

As in all agricultural systems animal agriculture has its down sides. Too much animal fat in the diet, which is not a problem for the vast majority of poor people, is not healthy. Badly managed livestock can also be ruinous to land and water resources and can result in producing unacceptable amounts of greenhouse gasses and effluence, which can negatively affect people far removed from the offending livestock enterprises. The increasing numbers of both humans and livestock continues to heighten the threats posed by present and emerging zoonotic diseases for which there must be effective detection, monitoring and control systems.

Livestock produce about 30% of the agricultural gross domestic product (AGDP) in the developing world, and about 40% of the global GDP. Due to growing populations, increasing urbanisation, which raised the demand for easily cooked nutritious food, and rising incomes which allow people to express their food preferences, the demand for livestock products is the fastest growing agricultural market, especially for the products in which smallholders can be competitive.

There is no way to reach the goal of doubling of food production by 2050 without making livestock production more efficient, but this must be achieved while at the same time reducing the negative impacts of livestock products on human health and livestock on the environment. In countries such as China, India, Nigeria, South Africa and Uganda there are doubts about the capacities of their animal industries to respond to the rapidly increasing demand for foods of animal origin.

In this context, this publication on **The role of livestock in developing communities: enhancing multifunctionality** is a very timely and valuable contribution. It is timely because of the urgent need to properly direct the renewed interest in agricultural development that was catalysed by the 2008/9 global food price crisis, which provided vivid warnings of the dire consequences of continuing to neglect agriculture. It is valuable because of the need to find innovative ways of dealing with the contradictions between the legitimate demands of consumers in developing and emerging economies for more animal-source foods and the equally valid concerns of the international community about the negative environmental impacts of animal agriculture. This calls for science-based critical assessments of current trends, the development of innovative strategies and future directions. This book presents the consensus of discussions on these issues that were held in a satellite symposium involving eminent scientists and practitioners from all regions of the world as part of the Tenth World Conference of Animal Production, held in Cape Town, South Africa, November 2008.

The authors recognise that the analyses, assessments and development strategies presented in the book's 10 key chapters are by no means complete but they do make a compelling case for improving efficiency in the use of production resources, constant monitoring of the dynamics of the systems and of the changes imposed by various externalities. It provides examples of major issues that will need further attention. These include, but are not limited to, the potential for expanding the use of less favoured rainfed lands for productive agriculture, support for small farm systems-based agricultural growth, the role of livestock in reducing poverty and hunger, improved use of natural resources to reach technical potentials, increased investments in agricultural research aimed at achieving sustainable yield increases and improved productivity from animals, and reduced negative impacts on climate change.

I congratulate the editors for their initiative, the authors for their efforts, and recommend this book to researchers, practitioners, development agents, decision makers and planners. I am confident that it will play an important role in improving understanding of the contributions of livestock to developing communities and the opportunities that animal agriculture could, and must, make to enhancing economic growth and prosperity.

Prof Monty Jones

Executive Director, FARA and Chairperson, GFAR

World Food Prize Laureate, 2004

Extraordinary Professor, University of the Free State, South Africa