



Livestock, Fodder, Pastures and People

An Integrated Study in the Northern Areas of Pakistan

Editors

I. A. Wright and A. J. Duncan



About the Organisations

The **International Centre for Integrated Mountain Development** (ICIMOD) is an independent 'Mountain Learning and Knowledge Centre' serving the eight countries of the Hindu Kush-Himalayas – Afghanistan , Bangladesh , Bhutan , China , India , Myanmar , Nepal , and Pakistan  – and the global mountain community. Founded in 1983, ICIMOD is based in Kathmandu, Nepal, and brings together a partnership of regional member countries, partner institutions, and donors with a commitment for development action to secure a better future for the people and environment of the Hindu Kush-Himalayas. The primary objective of the Centre is to promote the development of an economically and environmentally sound mountain ecosystem and to improve the living standards of mountain populations.

The Macaulay Institute is a scientific research organisation based in Aberdeen, United Kingdom. We bring together many disciplines to develop a better understanding of the environment and society's interactions and impacts on it; the quality and relevance of our work have established the Institute as a premier centre for land use research in Europe. The Institute's goal is "research today for land use tomorrow".

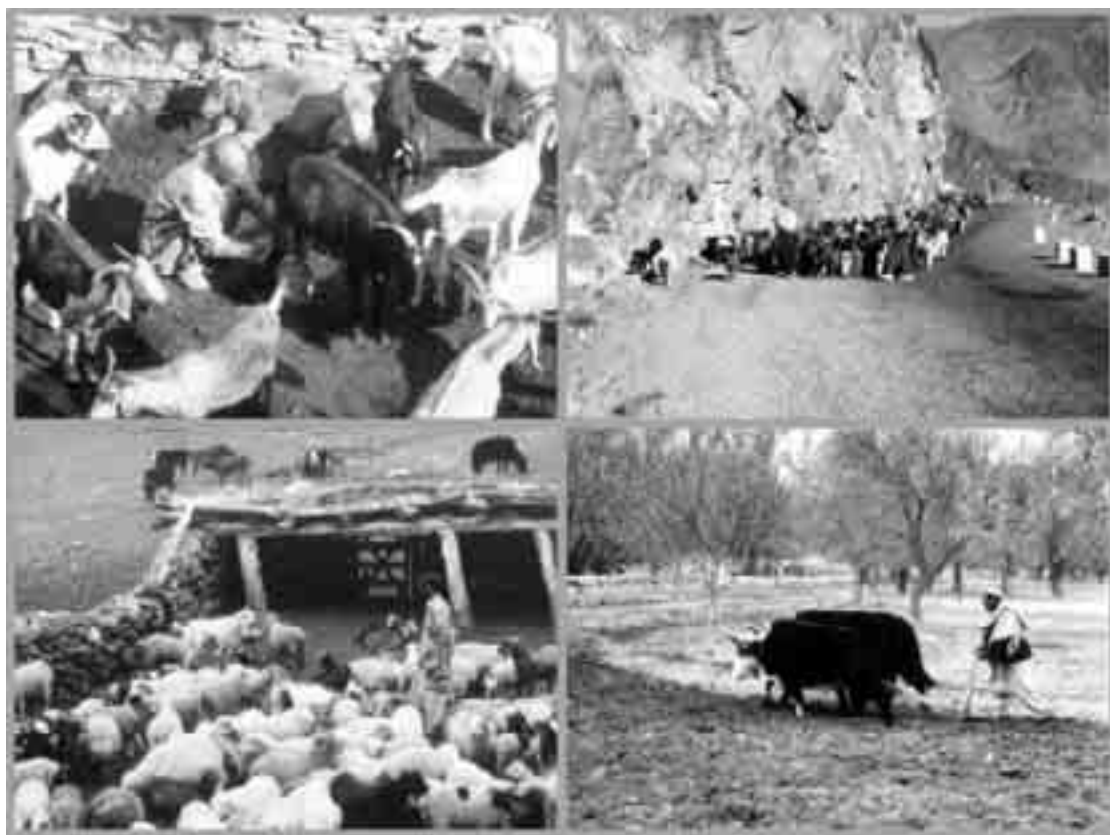
The Institute has 300 staff and students including soil, plant and animal scientists, geographers, socio-economists and IT specialists, who work together in interdisciplinary teams to meet the needs of land managers and policy makers in the UK, Europe and worldwide.

Research is concerned with the physical, environmental and social consequences of land use and focuses on:

- quality of life, the public good and wealth creation,
- the impact of land use on environmental quality, and
- evaluating the trade-offs between the environmental, economic and social objectives of land use.

Livestock, Fodder, Pastures and People

An Integrated Study in the Northern Areas of Pakistan



Editors

I.A. Wright and A.J. Duncan

International Centre for Integrated Mountain Development
Kathmandu, Nepal
June 2005

Copyright © 2005

International Centre for Integrated Mountain Development
The Macaulay Institute
All rights reserved

ISBN 92-9115-059-2**Published by**

International Centre for Integrated Mountain Development
G.P.O. Box 3226
Kathmandu, Nepal

Cover Photos

Jürgen Clemens

Editorial Team

Matthew Zalichin (Consultant Editor)

A. Beatrice Murray (Editor)

Dharma R. Maharjan (Technical Support and Layout Design)

Printed and bound in Nepal by

Hill Side Press Pvt. Ltd.
Kathmandu, Nepal

The views and interpretations in this publication are those of the authors. They are not attributable to the International Centre for Integrated Mountain Development (ICIMOD) or The Macaulay Institute and do not imply the expression of any opinion concerning the legal status of any country, territory, city, or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

Editors' Preface

In 1998 a research project began to study the possibilities for improving livestock productivity in the Karakoram Mountains in Northern Pakistan. The project, known as the Agri-Karakoram Project, aimed to examine the constraints to livestock production and to explore ways of overcoming some of those constraints while sustaining the fragile mountain ecosystem. The research was funded by the European Commission under the INCO-DC programme and involved seven organisations:

- ◆ The Macaulay Institute, United Kingdom,
- ◆ Spanish Council for Scientific Research (Consejo Superior de Investigaciones Científicas), Spain,
- ◆ Department of Geography, University of Bonn, Germany,
- ◆ The Aga Khan Rural Support Programme, Pakistan,
- ◆ Pakistan Forest Institute, Pakistan
- ◆ Pakistan Agricultural Research Council, Pakistan, and
- ◆ International Centre for Integrated Mountain Development, Nepal.

This book represents the outcome of that project. It describes the research process, summarises the findings by identifying some of the key biological and socioeconomic constraints to the improvement of livestock productivity, and suggests ways in which some of those constraints may be overcome. We thank ICIMOD for making their facilities and expertise available to publish the findings.

Although the project was undertaken in Northern Pakistan, we believe that some of the principles identified are of wider relevance to other similar mountain agricultural systems. The project ended in 2002, the International Year of the Mountains. We hope that the findings in this book will make a small contribution to the livelihoods of mountain people in general and to those in the Karakoram Mountains in particular.

We dedicate the book to all those in Northern Pakistan who contributed to the project, but particularly to the people of Bunji, Minapin, Morkhun, Bargo-Bala, Gahkuch-Bala, and Darkut, and to the numerous staff of the Aga Khan Rural Support Programme who participated in many ways.

Iain Wright
Alan Duncan
The Macaulay Institute

Acknowledgements

The editors and authors of this book thank the European Commission INCO-DC programme for funding this project; we are particularly grateful to Mr Dirk Pottier of the European Commission for his support and guidance during the conduct of the project. We wish to thank Professor Ehlers (University of Bonn) for academic background and support to the socio-economic studies. We are also grateful to the staff at ICIMOD, and in particular A. Beatrice Murray, Dharma R. Maharjan, and Matthew Zalichin for undertaking the technical editing, design layout, and distribution of this book. We owe our sincere thanks to the many staff from the Aga Khan Rural Support Programme who assisted in many ways to make the project possible, often under difficult circumstances. Above all, we owe very sincere thanks to the many people in the communities and in different government and non-government institutions who provided not only data and local expertise, but also showed such generous and welcoming hospitality to us all.

Executive Summary

The Northern Areas of Pakistan is a mountainous, semi-arid region. Livestock are an important component of the local economy and are managed according to a system of transhumance. Animals are kept in villages in the valleys over winter where they subsist on a diet of cereal crop residues and alfalfa, while in the summer they are moved to high pasture areas. The area has undergone rapid change over the last 20 years as a result of the construction of the Karakoram Highway, as well as of the activities of the Aga Khan Development Network and other agencies. A multi-participant research project was established in 1998 to assess the impact of development change on the livestock sector. The objective of the project was to examine the influence of infrastructural change on livestock management with a view to suggesting ways of improving livestock-dependent livelihoods while sustaining the fragile natural resources in the region. The study was carried out in villages from two geographical transects, differing in ease of access, and from three agro-ecological zones. The Karakoram Highway transect (KKH) ran along the Karakoram Highway and benefited from the associated improvements in infrastructure. The Gilgit-Ghizer Region transect (GGR) was mainly served by unmetalled roads with a less-developed communication infrastructure. The project focused on (1) livestock production and nutrition, (2) pasture resource utilisation, and (3) socioeconomic aspects of livestock production.

The results on livestock production and nutrition showed that among the major stored feeds, wheat straw was used in highest quantity, followed by alfalfa, maize stovers, and wild grass. Overall, the average liveweight and body condition scores were highest in late summer and then declined, reaching the lowest levels in February. The summer maxima were higher in the GGR transect than in the KKH transect. The households in the GGR transect kept more livestock, but the amount of feed resources stored for use over winter relative to herd requirements for maintenance were significantly lower than in the KKH transect. In winter, livestock in the GGR transect lost liveweight and body condition faster than in the KKH transect. Also, average milk production per mature adult cow was greater, and reproductive efficiency higher, in the KKH than in the GGR transect. The amount of fodder sold was significantly higher in the GGR than in the KKH transect.

The pasture ecology component of the project emphasised the important role that pastoral resources play in the overall livestock enterprise. Until now there has been little information available on the nature of the pasture resources and the extent to which they are over- or under-utilised. The project classified the vegetation communities present in the Northern Areas for the first time. Pasture productivity was found to be low on foothill rangelands, intermediate on dry-temperate pastures, and high on alpine pastures. There was also a change in

vegetation type from predominantly shrub-based vegetation on foothill and dry-temperate pastures to a vegetation resource dominated by grasses and forbs on alpine pastures. Seasonal data on pasture utilisation indicated that production and utilisation were reasonably well-matched on alpine pastures, but that a potential biomass surplus existed on dry-temperate pastures in spring. The utilisation of alpine pastures appeared to be lower in the KKH transect than in the GGR transect, suggesting that more animals could be grazed on the KKH pastures. Quantitative data on the seasonal availability of biomass for utilisation by livestock will help to inform decisions about potential changes to patterns of pasture management. Such information is particularly important with current changes in traditional patterns of transhumance which are being driven by external changes such as improved infrastructure, and educational and off-farm employment opportunities.

The final component of the project addressed socioeconomic and external issues surrounding livestock production in the Northern Areas. An important focus of this part of the research was on farmers' perceptions of opportunities and constraints in the livestock subsector. The results showed that farmers keep livestock for a number of reasons with milk and dung production being high among their priorities.

Various external factors are currently leading to changes in farm economies, especially the introduction of cash cropping, such as potato production, and improvement of access to off-farm employment and education facilities. In areas where these pressures are most acute, such as along the KKH transect, this is leading to a change in the role of livestock within the household economy. Increased off-farm employment and increased levels of education are reducing the availability of labour for tending livestock. The livestock sub-sector, however, appears to have been insulated from increased accessibility to markets, since animal products tend to remain within farm households. Improved infrastructure appears to have led in some cases to reductions in utilisation of alpine pastures with animals being stall-fed throughout the year near homesteads. In spite of growing demands within the region for meat and milk, only a few livestock owners have thus far started regular marketing of animal products.

The picture that emerged from the project is of an area undergoing transition. Livestock production remains a very important component of the household economy in this mixed mountain agricultural system. Infrastructural development, while opening marketing channels, also appears to have improved opportunities for non-livestock related activities, with the result that farmers in the KKH transect in particular appeared to be less heavily dependent on livestock production than those in the GGR transect. Despite this, production efficiency appeared to be higher and more seasonally stable in the KKH transect even though animal numbers were lower.

There is both a quantitative and qualitative shortage of fodder in winter and a number of ways have been identified to alleviate this shortage. Little attention,

however, has been paid to ways of improving the utilisation of the grazed pasture in spring and summer which could ensure maximum recovery of body condition of livestock in summer and so reduce winter feed requirements; this is an area that deserves further research. Since individual livestock production in many cases is low, there may be a case for reducing livestock numbers per household, but this may conflict with traditional or cultural requirements. Currently most livestock products stay within the household and there is considerable scope for improving the commercial aspects of livestock production, including their marketing.

The project has identified a number of constraints and options for the future development of the livestock subsector in the Northern Areas of Pakistan. What is now needed is adaptive, participatory, action research to develop the most promising of those actions.

Acronyms and Abbreviations

AKRSP	Aga Khan Rural Support Programme
AOAC	Association of Official Agricultural Chemists
AUE	animal unit equivalents
BCS	body condition score
DCZ	double cropping zone
FAO	Food and Agriculture Organization
GGR	Gilgit-Ghizer Region
GLM	generalised linear models
hh	household
HKH	Hindu Kush-Himalayan(s)
KKH	Karakoram Highway
LW	liveweight
ME	metabolisable energy
NGO	non-government organisation
REML	residual maximum likelihood
SCZ	single cropping zone
TCZ	transitional cropping zone
TWINSpan	Two Way Indicator Species Analysis
VO	village organisation
WO	women's organisation

CONTENTS

Editors' Preface

Acknowledgements

Executive Summary

Acronyms and Abbreviations

1 – The Agri-Karakoram Project: An Introduction 1

Alan J. Duncan, Farman Ali, and Iain A. Wright

2 – Livestock Feeding and Production 9

*Abdur Rahman, Alan J. Duncan, David W. Miller, Pilar Frutos,
and Atiq-ur-Rehman*

3 – Pasture Productivity and Utilisation 23

*Raja M. Omer, Alison J. Hester, Iain J. Gordon, Sardar M. Raffique,
and Michael D. Swaine*

4 – Human and Economic Issues Associated with Livestock Production 35

Jürgen Clemens

5 – A Systems Approach to Understanding Constraints and Opportunities 57

*Iain A. Wright, Alan J. Duncan, Iain J. Gordon, Jürgen Clemens,
Abdur Rahman, Raja Omer, Alison J. Hester, Sardar Rafique, Atiq-ur-Rehman,
Pilar de Frutos, Ataullah Baig, Neil Chalmers, and Grant C. Davidson*