

CONTENTS

Preface	i
Acknowledgments	iv
Contents	vi
List of Figures	xi
List of Tables	x
List of Abbreviations	xiv
List of Photos	xvi
Abstract	xvii
Zusammenfassung	xx
1. INTRODUCTION	1
1.1 Problem Identification	1
1.2 Selection of the Study Area	11
1.3 Applicability of General Theories	20
1.4 Approach and Scope of the Study	29
1.5 Definition of the Concept	35
1.6 Materials and Methods	44
1.6.1 Reconnaissance Survey and Selection of Sample Areas	44
1.6.2 Interviews and Observer Participation	45
1.6.3 The Survey of Rangeland Ecology and Quadrat Methods	46
1.6.4 Mapping	47
2. GEOGRAPHY OF STUDY AREA	49
2.1 Studying Frame - The Western Sichuan	49
2.1.1 Physical Conditions and Animal Husbandry of Sichuan Province	49
2.1.2 Ecological Potential and Constraints of Western Sichuan	53
2.1.2.1 Topography and Landform: their Effects	53
2.1.2.2 Climates and their Catastrophes impacting Pastoral Production	55
2.1.2.3 Vegetation in Western Sichuan.....	63
2.1.2.4 Subdivision of the pastoral area in western Sichuan	71
2.2 The Case Study Area - Zamtang County	72
2.3 Role of Pastoralism in Economic Development	74
2.3.1 Pastoralism – the basic Subsistence	75
2.3.2 Livestock – Supporting Pillar	79

3. RANGELAND RESOURCES ON THE PLATEAU	87
3.1 Range Resources in Western Sichuan	87
3.1.1 High-frigid Meadows	89
3.1.2 Subalpine Open-Woodland Meadows	92
3.1.3 Shrub Meadows	93
3.1.4 Swamp Meadows	94
3.2 The Flora of the Rangelands	95
3.3 Quality of Natural Pastures	97
3.4 The Ecological Characteristics of Rangeland	100
3.4.1 The Life-forms and Ecotypes of Plants	100
3.4.2 The Growing Phases of Plants	104
3.4.3 The Features of the Rangeland Ecosystem	107
3.5 Carrying Capacity in Western Sichuan and its Dynamics	111
 4. STATUS AND TRENDS OF RANGELAND ECOSYSTEM	115
4.1 The Causes of Rangeland Degradation	115
4.1.1 The Pressures of Population	117
4.1.2 The Contradiction between Private Livestock and Communal Land	121
4.1.3 Destructive Effects of Treading	123
4.1.4 The Declining of Animal Diversity	124
4.1.5 Man's direct Destruction of Vegetation	125
4.1.6 The Lack of Markets	126
4.2 The Effects of Degradation	127
4.2.1 Decrease in Edible Forage and the Increase in Poisonous and Harmful Plants	128
4.2.2 Shortening Grass-layers and Declining Grass Yields	130
4.2.3 The Increase of Rat-damage and Pest-damage	131
4.2.3.1 The increase of Rodent-damage.....	132
4.2.3.2 The increase of Pest-damage	133
4.2.4 Soil Erosion and Desertification	134
4.2.5 Unstable Production and low Economic Returns	136
4.2.6 Degeneration of Cold Season Pastures	137
4.3 Rangeland Ecosystems Response to Pressures	139

5. FROM THE TRADITIONAL STRATEGIES TO THE MODERN MANAGEMENT	144
5.1 Seasonal Characteristics of the High-frigid Rangelands	145
5.1.1 The Causes of Seasonal Pastoralism	145
5.1.2 The Seasonal Dynamic of Quality and Quantity	146
5.1.3 The Division of Seasonal Pastures and their Grazing Systems	148
5.1.4 Sufficiency and Insufficiency of Seasonal Pasture	150
5.2 The Traditional Adaptive Strategies	152
5.2.1 The Traditional Grazing Management	152
5.2.2 Keeping Mobile Livestock Husbandry – A Strategy of Sustainable Utilization	154
5.2.2.1 The Seasonal Grazing System in western Sichuan	154
5.2.2.2 The Ecological and Socio-Economic Significance of Seasonal Migration	163
5.2.3 Keeping enough Livestock -- A Survival Strategy	168
5.2.4 Burning	171
5.3 Modern Development – Chance or Crisis?	173
5.3.1 Enclosure of Rangeland	175
5.3.2 Sedentarization	181
5.3.3 Cultivation of Forage Grasses and Supplementary Feeding	185
5.3.4 Strengthening of Veterinary Services and Disease Prevention	189
5.3.5 Marketing of Animal Products	190
5.3.6 The Promotion of Seasonal Animal Husbandry	193
5.3.7 Fertilizing Pastures	196
5.3.8 Improvement and Rehabilitation of Rangeland	198
5.3.9 Extermination of Rat and Pest	202
6. SUSTAINABLE USE OF RANGELANDS ON THE PLATEAU AND ITS APPROACHES	206
6.1 Indicators and Assessment of Unsustainability in the Rangeland Ecosystem of the Plateau.	206
6.2 Sustainable Potential and Constraints	209
6.2.1 Status and Trends in Pastoral Production System	210
6.2.2 Political and Socio-economic Sustainability	209
6.2.2.1 The recent transformation and administrative institution	213
6.2.2.2 The role of governments in pastoral sectors	216
6.2.3 Land Use Systems and Ecological Sustainability	221

6.3 Sustainable Approaches and its Perspectives	226
6.3.1 The Research Imperative for Indigenous Knowledge	226
6.3.2 Developing a Long-Term Approach for the Environmental Dimension ...	233
6.3.3 Participatory Approaches for Natural Resources Management	235
6.3.4 Improvement of Rangeland Management and Policy Reforms	238
BIBLIOGRAPHY	244
APPENDIX	261
PHOTOS	269