

Bonn 2011



**21-25 October 2010
Regional Workshop in Lhasa, P.R. China**

**Pastoralism and Rangeland Management
on the Tibetan Plateau in the Context of
Climate and Global Change**

Edited by Hermann Kreutzmann, Yang Yong, Jürgen Richter

giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

BMZ  On behalf of
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Preface

The regional workshops within the mountain development programme of InWEnt¹ aim at addressing pressing problems of mutual interest among the participating partners by focusing on a specific topic. In 2010 two conferences on pastoralism were held in the framework of the mountain development programme. Complementing the series that started with the Khorog and Kashgar workshops in July the Lhasa gathering happened to be the final part with a special focus on pastoralism and rangeland management on the Tibetan Plateau.

It seems to have been the appropriate timing to emphasize upon a pressing issue that is generating increased and rejuvenated interest in the debates on biodiversity, climate and global change.

Planners are challenged by designing concepts for nature protection and resource management in order to implement “green policies”. Decision-makers keep in mind the dual challenges between livelihood improvement and natural resource management by translating and transferring it into modernisation programmes. Far-reaching policies that aim at a reconciliation between ecological necessities and economic demands are tested and implemented in a grand design. Especially the Tibetan Plateau is an arena where the term eco-shelter has become a specific meaning that is affecting the reconciliation between nature and society as well as leading to far-reaching transformations in settlement structures and economic strategies. Recent interventions have changed and modified pastoral practices, terminated and extinguished certain traditions and opened-up new hitherto unknown and unexpected opportunities for pastoralists on the Tibetan Plateau.

Lhasa provided the appropriate and sophisticated venue for a workshop highlighting recent developments in pastoralism and its linkages to agriculture and other economic sectors. On the vast Tibetan Plateau pastoralism and rangeland management are not only challenges for regional planning, both sectors offer a tremendous economic potential and are proof for the adaptive properties and resilience of pastoralists exposed to harsh environmental conditions and all kinds of changes. Lhasa is the centre for most institutions that are involved in evaluating,

1 On 1 January 2011, InWEnt became part of Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

planning and implementing programmes and packages. The workshop profited from the local and neighbouring expertise. Academic institutions from pastoral and agro-based research were as well represented as delegates of implementing agencies in the wider field of poverty alleviation and rural development. The specificities of the Tibetan Plateau were discussed in relation to neighbouring regions that are part of InWEnt's mountain development programme. Consequently, the gathering of scientists, decision-makers and representatives from implementing agencies fulfilled once again the goal to enable a fruitful exchange of ideas and to create a platform for mutual debate in a community of learning.

The proceedings volume is assembling the keynotes and case studies that were presented in the plenary sessions. Some of the presented insights are meant to stimulate further debates on a significant intervention in the pastoral sector. With this proceedings volume we attempt to reach a wider readership that has an interest in the changes, challenges and transformations in pastoralism and rangeland management. Some of the key concepts, designs for modernisation and aims for the immediate future in the rural areas of the Tibetan Plateau are presented here in a concise and easily approachable manner by leading experts in the respective fields. The book informs a community of practice for whom in addition to the keynotes the results of group work and discussions are secured for future reference. The workshop participants have shared their recommendations.

The editors are grateful to all contributors who have explained their views in a precise and sound manner. Special thanks go to the local organisers represented by the experienced staff of the Tibetan Academy of Agricultural and Animal Sciences (TAAAS) for a great show of hospitality, for all arrangements that have contributed to a successful regional workshop. The results will be made available in Chinese and in English language.

Hermann Kreutzmann, Yang Yong, Jürgen Richter

Welcome Speech by Yanqing Zhang, TAAAS

With the great support from the People's Government of the Tibet Autonomous Region and the strenuous efforts from our co-sponsors, InWent and ICIMOD, the Regional Workshop on Pastoralism and Rangeland Management on the Tibetan Plateau in the Context of Climate and Global Change are having a grand opening in the ancient city of Lhasa today. On behalf of TAAAS, the host, I would like to offer my warm welcome and cordial greetings to friends from afar, representatives of different fields and all the scholars and experts attending this workshop.

TAAAS is the only comprehensive scientific research institution in the Tibet Autonomous Region that combines agricultural and pastoral research, development and promotion and experimentation and demonstration of new varieties and technologies. Since 1995 when it was set up, TAAAS has aligned itself with the top priorities of the government and party committee of TAR. It has always been committed to the sustainable and leapfrogging development of agriculture and animal husbandry in TAR. Through long-term unremitting efforts, we have achieved encouraging results in scientific and technological innovation, commercialization and outreach in the fields of agriculture, animal husbandry, grassland, horticulture and quality and safety of agricultural products. We have scored remarkable progress in the following areas. Our agricultural research and innovation capabilities have accomplished breakthroughs, winning 122 national and provincial scientific research awards. Our capacity for providing technical services and outreach has been promoted. We have seen significant improvement in the coverage of improved varieties and contribution of technology to the development of agriculture and animal husbandry. Commercialization of scientific and technological achievements and establishment of demonstration bases have progressed remarkably as well, with a National Agricultural Science Park and 12 well-functioning technology demonstration bases having been built. We have deepened international exchanges and cooperation in science and technology, establishing friendly cooperative relations with more than 50 research institutions and universities from home and abroad. We have continued to invest in personnel training, strengthening innovation teams, and improving research conditions and building infrastructure. With the consistent support from the various ministries of the central government and the TAR party committee and government, TAAAS has become the backbone in promoting the specialization, modernization and commercialization of agriculture and pastoralism of the Tibetan plateau.

The strategic objectives and missions put forward at the central government's fifth working conference on Tibet include building Tibet into an important

agricultural base for niche plateau products and a national ecological shelter. TAAAS is making its every effort to strengthen scientific and technological innovation, accelerate commercialization, speed up disciplinary development, increase technical services, and enhance capacity building so to promote and support better, faster and greater development in the agricultural and pastoral sectors. By greatly increasing per-unit yields of grains and edible oil, and the productivity of livestock breeding and vegetable growing, we provide strong technological support and guarantee to increase the income for farmers and herdsmen, realize a greater level of production capacity and build a new socialist countryside

The impact of climate change and economic globalization is being more and more felt in agriculture and animal husbandry. Rangelands in Tibet cover vast areas and have a rather fragile ecological environment. To address climate and global change, the Chinese central government and the TAR government have taken a series of measures to tackle climate and global change in the agricultural and pastoral sector. We have adopted major initiatives such as building an agricultural base for niche plateau products and a national ecological shelter, strengthening rangeland ecological protection and restoration efforts and developing niche agriculture and animal husbandry. TAAAS has dedicated a whole research team to carry out long-term studies on the impacts of climate and global change on farming and animal husbandry, as well as the countermeasures for these transformations, and have made gratifying progress. We firmly believe that, with the great support and enthusiastic participation of our colleagues in the field, grassland ecological environment on the Tibetan plateau will continue to be improved. By making full use of all favorable factors and conditions, pastoralism will witness sustainable and rapid development even in the new climate conditions.

Ladies and gentlemen, we surely will have in-depth discussions and exchanges at this workshop on pastoralism and rangeland management on the Tibetan plateau in the context climate and global change. My colleagues in Tibet must firmly seize the opportunity and keep an open mind to learn from foreign experts and scholars, adjust and improve their researches, adopt a more open attitude, set more specific and relevant objectives, and strengthen exchange and cooperation with both domestic and international experts and scholars. Here again we warmly welcome all the experts, scholars and international friends to visit us and inspect on our work at TAAAS, and I also sincerely welcome the increase of cooperation and exchanges to jointly promote technological innovation and achieve fast and steady development in the agricultural and pastoral sectors on the Tibetan plateau.

Finally, I wish the Regional Workshop on Pastoralism and Rangeland Management on the Tibetan Plateau in the Context of Climate and Global Change a full success! Wish all our friends have a pleasant and healthy stay in Tibet. Tashi Delek!

Welcome Address by Madhav Karki, ICIMOD

On behalf of ICIMOD, it gives me a great honour and pleasure to warmly welcome you all to this regional workshop on: Pastoralism and Rangeland Management on the Tibetan Plateau in the Context of Climate and Global Change jointly organized by TAAAS, InWEnt, ICIMOD and NPC, Nepal. At the outset, I would like to express my gratitude to the TAR Govt. and Govt. of PRC for hosting this workshop in Tibet, Lhasa under the overall leadership of TAAAS.

The International Centre for Integrated Mountain Development (ICIMOD) was established in 1983 with the dual mandates of reducing poverty and conserving the environment in the Hindu Kush-Himalayan (HKH) region which covers five provinces of China – Xinxiang, Tibet, Sichuan, Yunnan, and Guizhou provinces of China. It is an autonomous, non-political and intergovernmental organization with 8 founding member countries that include Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan. The primary objective of the Centre is to “help promote the development of an economically and environmentally sound mountain ecosystem and to improve the living standards of mountain populations of the region”.

Rangelands cover about 60 percent of the 4.3 million km² of the Hindu Kush-Himalayan (HKH) region and directly provide a livelihood to the large population living there. Rangelands contain diverse geographical and cultural landscapes which have been shaped both by the forces of nature and by the communities that inhabit them. Over thousands of years, communities have developed their own particular ways of adapting to geophysical, climatic, and biotic conditions. However, the important role that pastoralists play as the custodians of rangeland ecosystems has not been sufficiently valued by decision-makers. Rangelands remain a generally neglected sector in terms of research, legislation, government planning, and particularly of spending for sustainable development. This situation has resulted in poor management decisions and has been a major cause of rangeland degradation and desertification.

As you are all aware, globalisation and climate change have an increasing influence on the stability of fragile rangeland ecosystems and the well being of the pastoralist community, a large number of who are poor and marginalized. ICIMOD working with our member country partners aims to assist these herders and farmers to understand these changes, adapt to them, and make the most of the opportunities, while addressing multiple issues and challenges many of which are of trans-boundary and upstream-downstream nature. We support regional research and development programmes through partnership jointly

working with international, regional and national institutions such as InWEnt, TAAAS and NPC. We facilitate the exchange of data, information, knowledge and experience, and serve as a regional knowledge hub. We strengthen knowledge networking among regional and global centres of excellence.

We feel that the organization of this regional workshop is timely as well as very important to address the multiple challenges the Tibetan range and pasturelands are facing. In our view following key questions may be important for this workshop to consider for discussions:

- a) What aspects of knowledge generation should the future programmes focus on?
- b) What kinds and types of formal and informal institutional innovation should we promote?
- c) Since Tibetan pastoralist society as well as the rangelands are undergoing massive transformation, what strategies should be adopted to achieve livelihood improvement/ diversification e.g., multiple use of rangelands and livestock development for income supplementary income generation?
- d) What sort of training and capacity building programme should be designed and should we design both skill and knowledge enhancement?
- e) What policy inputs/innovation can be instrumental in effecting a major policy reform process so as to address both the country-specific requirements and regional commonality?

ICIMOD is very pleased and proud to co-organize this regional workshop together with our long standing collaborator and partner InWEnt, Germany as well as with our regional partners TAAAS and NPC since we believe that the rangelands provide a bundle of important ecosystem services ranging from grazing, fresh water, tourism, biodiversity, carbon sequestration and hydrology to the people of Tibet and surrounding regions.

In closing, I wish you all a wonderful and successful workshop. Once again, I welcome you warmly and wish a very productive future partnership between ICIMOD and all of you.

Welcome Address by Jürgen Richter, InWEnt²

The conference on “Pastoralism and Rangeland Management on the Tibetan Plateau in the Context of Climate and Global Change” is part of InWEnt’s mountain development programme. Climate and global change seem to be the two dominant features of transformation that pose challenges to all communities and societies. The environments at the limits of human habitation that are characterized by extreme thermal and/or hydraulic conditions – such as deserts, steppes and high mountain regions – might be affected to a higher degree by any kind of change than the more moderately configured areas on earth. Therefore, the Tibetan Plateau is of prime interest and in the focus of research when the understanding of change processes is at stake.

It is a great pleasure to be back in Lhasa after a period of six years. The theme of climate and global change poses an ideal portfolio when applied to the vast steppes of the Changtang plateau and the Himalayan Mountains. Pastoral strategies occupy the largest space for human activities to make a living based on local resources.

This conference is the second in a dual set of regional conferences that address the issue of pastoralism and rangeland management. They are complementary in a spatial and a thematic sense. The first one was successfully held in July 2010 in Khorog and Kashgar. Highlighting pastoral practices in the Pamirs, Hindukush, Karakoram and Kun Lun Shan the rugged mountains of the western project area were investigated. Today we shift our focus to the Tibetan Plateau where vast and high-lying tracts offer the space for pastoral activities.

Here in Lhasa we continue our well-established efforts to convene experts and colleagues for a mutual exchange and learning experiment. Again we have invited eminent professionals with varying expertise, well-versed development practitioners with vast experience and qualified scientists with a sound academic background. These participants contribute from their work experience on the Tibetan Plateau and from neighbouring mountain ranges.

In its mountain development programme in Asia InWEnt has selected a comprehensive approach that is based on training programmes, conferences and workshops including exposures to field experiences. To implement such a programme a number of partners that share similar aspirations and visions is required. With our partners in China, Nepal, Pakistan and Tajikistan we have jointly created such a common ground that provides us with a platform to

2 On 1 January 2011, InWEnt became part of Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

combine methodological training with input-relevant exposure. Our practical experiences have proven that the selected approach has been successful. We derive encouragement from previous events that our attempts were instrumental to contribute to mountain development in all partner countries.

In 1974 the Munich Mountain Manifesto set the stage for InWEnt's engagement in mountain development. Last year the Feldafing manifesto addressed similar issues in a contemporary context 35 years later. More than a generation has grown up and still the challenges and constraints in mountain development are significant and pressing issues. Themes and topics might have changed and expanded, have got new labels and connotations, but basically we are still asked to pursue our task. The beginnings of the specific and comprehensive approach within the mountain programme can be traced back for more than a decade when InWEnt began to organize international mountain-related conferences in Asia. Initially the aim was to convene professional knowledge and expertise for a fruitful exchange of experiences, policies and conceptual ideas for mapping the future path. After a beginning with general topics and country studies the demand for theme-specific conferences and workshops grew. Places that are closely connected to mountain regions were selected as venue for conferences: Kathmandu, Chengdu, Dushanbe, Lhasa, Gilgit, Kashgar and Khorog are now associated with a certain focus during conferences. All locations are somehow linked to Feldafing, where InWEnt's mountain development programme was conceived and where it is managed, monitored and steered. The link between Asian Mountain regions and Bavaria and the European Alps has been of significant importance. The experiences of trans-boundary cooperation, expert knowledge in nature protection and sustainable mountain development that could be tapped in the vicinity of Feldafing have stimulated the programme, training courses and international gatherings. As I mentioned before the Feldafing Declaration of 2009 is a direct outcome of these activities.

InWEnt's mandate is focussed on human capacity building for the management of socio-economic change. To address this issue a one-year-long course in international leadership training (ILT) was designed. So far we have trained 45 highly-motivated and pre-selected promising professionals from China, Nepal, Pakistan, and Tajikistan. The third batch of participants has arrived in Germany and seems to be again a promising group of highly-motivated young professionals. The establishment of the ILT has created a community of knowledge-sharing. Long after the training has ended experiences and views are exchanged within the alumni community.

The idea of mutual learning from Asia and Europe has inspired the Feldafing training courses. Real life experiences within the Alps are an integral part of the

training and have created bonds between professionals from Eurasia. The participants are trained in methods and in themes based on most recent concepts and research findings by expert trainers. This approach enables the transfer of knowledge between open-minded professionals. They are the heart of this programme and have created a community of learning, exchange and communication that is important for follow-up activities. Regional workshops and training courses are implemented in areas where the ILT-fellows come from. In addition to these brokers for professional communication their colleagues can participate, thus expanding the community of knowledge and tapping regional and international knowledge.

Therefore I wish the Lhasa regional workshop on “Pastoralism and Rangeland Management on the Tibetan Plateau in the Context of Climate and Global Change” a good start on the “roof of the world”. Here in Lhasa we are in a location where pastoralism has supported urban development. Herders from the vast tracts of the Changtang Plateau and the remote Himalayan valleys can be seen. On our field visit we shall experience the dimensions of what pastoralism means in the context of the Tibetan Plateau. Pastoralism is not restricted to academic deliberations. Pastoralism is the daily life experience of herders and their households, and pastoralism is always in the process of change. This conference is a timely gathering in order to understand the envisaged modernisation of herders’ lives on the Tibetan Plateau, to get insights in programmes of nature protection and rangeland management as they have been designed in the framework of the “green policies” and new “grassland laws”. The impact of resettlement and modernisation will be discussed in the framework of economic uplift and support. The winds of change are blowing strongly. To understand these changes and their impact on the immediate future of pastoralists is a prime goal of this conference. Let us start the workshop with sincere thanks to the organizers from our programme partner institution TAAAS in the excellent preparation of this conference and for their hospitality and warm welcome!

Welcome Speech by Gopi Nath Mainali, National Planning Commission, Nepal

First of all, on the behalf of National Planning Commission, Government of Nepal and I, it is my pleasure to welcome all of you in this regional workshop.

As we are all aware of the fact that the climate change has become a crucial issue, it will affect every aspect of our lives. We also have to adapt accordingly, because if we do not do so it is going to have a major impact on agriculture, health, industry, tourism and so on. Due to climate change the Himalaya-Hindukush-Pamir region can get severely affected. In this context, it is necessary to establish a common understanding and share the experiences with each other for making strategies and programmes. From this workshop we can gain knowledge about the current situation and issues regarding to pastoralism and rangeland management on the Tibetan Plateau and other mountainous countries as well.

Being located within the Himalayan Range, most of the geographical features and livelihood strategies are similar between Nepal and Tibet. So, I consider myself fortunate for getting the opportunity to participate in this workshop.

Finally, I would like to express my sincere thanks towards ICIMOD, InWEnt, and TAAAS for arranging such a great workshop. I am expecting that all participants will enjoy the dazzling heritages and culture of Tibet. Best wishes for the success of the workshop.

Welcome Speech by Ding Ye Xian, Vice Governor Tibet Autonomous Region

October in Lhasa is blessed with crispy autumn weather, thriving businesses and other signs of well-being, good fortune, prosperity and harmony. In this beautiful season, we are gathered here in the ancient city of Lhasa to attend the opening ceremony of the Regional Workshop on Pastoralism and Rangeland Management on the Tibetan Plateau in the Context of Climate and Global Change, co-sponsored by InWEnt, ICIMOD and TAAAS. On behalf of the People's Government of the Tibet Autonomous Region (TAR), I would like to offer my warm congratulations on the opening of the workshop and my warmest welcome and best regards to the experts, scholars and friends from both home and abroad.

Since the peaceful liberation of Tibet, particularly since the initiation of the reform and opening-up campaign, the TAR party committee and government have been upholding the unity of all ethnic groups in Tibet with the great support from the Communist Party of China (CPC) Central Committee and State Council and other provinces and cities across the country. Centering around the central authorities' guiding principles we have been following a development path with Tibetan characteristics and making the betterment of production and living conditions and the increase of income for farmers and herdsmen our top priority. While maintaining the long-term consistency of policies in Tibet, we have spared no efforts in building the new socialist agricultural and pastoral communities to improve local living and working conditions. We have achieved rapid economic and social development, getting closer to our goals of building a fairly well-off, peaceful, harmonious and ecologically-sound Tibet. The Gross Domestic Product (GDP) of TAR has maintained a double-digit growth rate for 17 consecutive years, surging to 44.136 billion Yuan in 2009. We have had bumper harvest for 17 consecutive years, with the annual total of grain and oil production exceeding 90 million metric tons. Livestock production has seen steady growth as well, with the capacity for main livestock products increasing every year and realizing a turnover of 5.603 billion Yuan in 2009. Development in Tibet's economic and social landscape in the past decades has exceeded that of thousands of years before. At present, the economy in Tibet is rapidly growing. The society is harmonious and stable. The people enjoy decent housing, employment, and cultural diversity. With all causes flourishing, we are witnessing a more harmonious society taking shape. I sincerely hope that experts at this workshop would take the opportunity to experience in person a

taste of Tibet's grotesque natural environment and unique cultural landscape and as well as its new developments and changes.

Distinguished experts, ladies and gentlemen, climate change is a major global concern recognized by the international community. Tibet is located on the Qinghai-Tibet Plateau, with a rugged terrain, vast territory, unique ecology and rich resources. It is well-known as the "Roof of the World," the "Third Pole of the Earth," "China's Water Tower", "River Source" and "Ecological Source." It has a profound impact on the climate in China and Asia and is considered the "starter" and "regulator" of climate change in Asia and even the northern hemisphere.

Rangelands are one of the earth's largest terrestrial ecosystems and play an important role in our response to the global climate change. Rangelands not only provide farmers and herdsman with the basic means of production to ensure their survival and development, but also form the important material foundation for pastoralism. The proportion of land area that rangelands account for and their unique geographical distribution highlight the vital importance of its unique and strategic position in national ecological security. In the meantime, the role of rangelands in countering climate change is proven irreplaceable. Rangelands represent not just ecological, but also economic, social carbon stock.

Climate change is an environmental issue, but also a development issue. Pastoralism is one of the pillar industries of the Tibet Autonomous Region and plays a pivotal role in the national economy. TAR has 12.3 million *mu* (= 820 000 hectares) of natural rangelands, accounting for about one fifth of the national total. However, due to the constraints of its location on the plateau and a variety of natural factors, local rangelands suffer from a fragile ecological environment and a serious shortage of production capacity, which greatly restrict the sustained, rapid and healthy development of pastoralism. In the context of climate and global change, pastoralism in Tibet is facing good opportunities as well as tough challenges. Rangelands constitute an important part of pastoralism and an important eco-shelter. The TAR government has always attached great importance to environmental protection and restoration of rangelands. To negate the adverse effects of global warming and climate change on pastoralism, we are actively seeking an effective response and strengthening scientific and technological research in many fields, with encouraging progress being made. Based on the strategic objectives put forward at the central government's fifth working conference on Tibet, the TAR government is now committed to building Tibet into an important agricultural base for niche plateau products and a national ecological shelter, speeding up rangeland ecological protection and restoration

efforts and strengthening pastoralism and rangeland management so as to increase our capacity to respond to climate change and economic globalization.

Climate and global change has multifaceted and deep-seated impacts on pastoralism and rangeland management of the Tibetan plateau. The issue has become the focus of attention of international community. The Chinese government and Tibet Autonomous Region are now recognizing it as a major economic and social development issue. It has also become a major scientific and technological issue studied by more and more experts and scholars in Tibet as well as the rest of the world. It must be resolved with the entire international community working closely together. This workshop has a highly relevant theme, rich content, specific tasks and clear targets. I believe that, through the active exploration and careful study by participating experts and scholars, the workshop will be able to produce useful suggestions for policies and measures in overcoming the challenges of climate and global change, have important academic influence, and make significant contributions in promoting Tibet's economic and social development.

Finally, I wish the Regional Workshop on Pastoralism and Rangeland Management on the Tibetan Plateau in the Context of Climate and Global Change a complete success! I wish all the experts and scholars good health and happiness in Tibet. Tashi Delek!

Abbreviations and Acronyms

ACAP	Annapurna Conservation Area Project
AKRSP	Aga Khan Rural Support Programme
APPA	Appreciative Participatory Planning and Action
CBS	Central Bureau of Statistics
CI	Conservation International
CAMC	Conservation Area Management Committee
CFUG	Community Forest User Group
CMC	Conservancy Management Committee
CPC	Communist Party of China
DDB	Dairy Development Board
DFRS	Department of Forest Research and Survey
DNPWC	Department of National Parks and Wildlife Conservation
EC	European Community
EnC	Engel coefficient
FAO	Food and Agriculture Organization
GB	Gilgit-Baltistan
GBC	Gilgit-Baltistan and Chitral
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GoN	Government of Nepal
GUG	Grazing User Group
HAN	Hotel Association of Nepal
HCRS	Household Contract Responsibility System
HKH	Hindukush-Karakoram-Himalayas
HVPS	High Value Products and Services
ICIMOD	International Centre for Integrated Mountain Development
IGC	International Grassland Congress
ILT	International Leadership Training
INWENT	Capacity Building International Germany
IPRP	Innovations for Poverty Reduction
IRC	International Rangeland Congress
IRG	International Resources Group
IUCN	International Union of Conservation for Nature
KPK	Khyber-Pakhtunkwa (formerly North-West Frontier Province-NWFP)
LMP	Livestock Master Plan
LNP	Langtang National Park

LRMP	Land Resources Mapping Project Report
MACP	Mountain Area Conservation Project
MAP	Medicinal and Aromatic Plants
MEA	Millennium Ecosystem Assessment
MJ	Megajoule (an energetic unit equal to one million Joule)
MoCTCA	Ministry of Culture Tourism and Civil Aviation
MPCPTES	Master Plan on Constructing and Protecting Tiber's Ecological Shelter
NARA	Nepal Association of Rafting Agents
NATA	Nepal Association of Travel Agents
NATA	Nepal Association of Tour Operators
NCCR	National Centres of Competence in Research
NMA	Nepal Mountaineering Association
NP	National Park
NPC	National Planning Commission
NPT	Nepal Tourism Board
NR	Currency Value in Nepalese Rupees
NSA	Namtso Scenic Area
NTNC	National Trust for Nature Conservation
NTSA	Nepal Tourism Sector Analysis
OECD	Organization for Economic Cooperation and Development
PES	Payment of Ecosystem Services
PFES	Payment of Forest Ecosystem Services
PMAC	Programme for Mountain Area Conservation
PRA	Participatory Rural Appraisal
PRES	Payment of Rangeland Ecosystem Services
PRs	Currency Value in Pakistani Rupees
RMB	Renminbi, Chinese currency Yuan
SAARC	South Asian Association for Regional Cooperation
SDC	Swiss Development Cooperation
SLSP	Strengthening of Livestock Support Project
SNP	Sagarmatha (Everest) National Park
TAAAS	Tibetan Academy for Agricultural and Animal Science
TAAN	Trekking Agents Association of Nepal
TAR	Tibet Autonomous Region
TPR	Tibetan Plateau Region
TURGAN	Tourist Guide Association of Nepal
UMBCP	Upper Mustang Biodiversity Conservation Project
UMCDP	Upper Mustang Conservation and Development Project
UNDP	United Nations Development Programme

UNEP	United Nations Environment Programme
UP ZRS	Science and Research Centre of Koper
USD	American dollar
VCC	Valley Conservation Committee
VDC	Village Development Committee
WPU	Wool Processing Unit
WRI	World Resources Institute
WWF	World Wide Fund for Nature



Source: Qi Xuebin 2004

The distribution of yak in the Inner Asian mountain ranges

»»» 1 Objectives and Structure of the Conference

Nyima Tashi³

1.1 Objectives

Prior to the workshop four objectives were identified and formulated that should enable the participants to discuss the challenges of the most recent changes in the pastoral sector on the Tibetan Plateau. Demanding a specific professional expertise in conjunction with the objectives the participants were selected. Four guiding principles were identified for structuring the consecutive steps of procedures during the conference (Figure 1):

1. Contribute to a deeper understanding amongst participants of the current situation in pastoralism and rangeland management on the Tibetan Plateau and in neighbouring mountain systems
2. Identify change processes that effect the sustainable livelihood of pastoral communities
3. Share experiences with coping strategies that are applied in mountain areas
4. Identify (and recommend) factors that contribute to resilience of pastoral systems and communities.

3 Vice President, Tibet Academy of Agricultural and Animal Husbandry Sciences (TAAAS), Lhasa

In addition, these formulated objectives fit in well with the overall objectives of InWEnt's mountain development programme. A unique feature of the Lhasa workshop was to gain a deeper understanding of policies recently implemented in the framework of eco-shelter strategies, green policies and modernisation processes. The implementation of those packages distinguishes developments in the PR of China from those in neighbouring countries. Consequently, one of the objectives of the conference was to inform professional colleagues about new insights and to debate differing experiences from a comparative perspective.

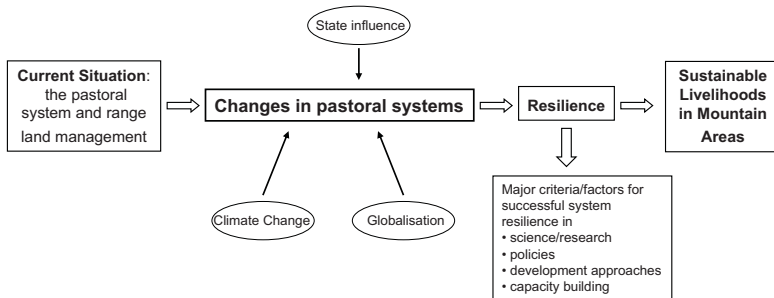


Figure 1: Flow chart of conference structure

1.2 Structure of the Workshop

The opening of workshop will be followed by two days of a conference-style dialogue in which relevant themes and concepts will be introduced in the format of keynote papers and case studies. We will share experiences and set the stage for an understanding and analysis of pastoral systems and rangeland management in different settings. This will lead us to a dialogue on the linkages with other economic activities and to a comparative perspective derived from neighbouring regions within the PR of China such as Xinjiang and with neighbouring countries such as Nepal, Pakistan and Tajikistan.



Photo 1: Hobbled yaks on the Tibetan Plateau
 (photograph © Nyima Tashi)

The case studies exemplify certain aspects such as eco-tourism in order to compare experiences in different settings and to identify certain good practices that have been implemented already. The broadening of income sources is not restricted to tourism practices alone. Consequently, we shall be investigating other sources for niche production that are used by pastoralists for generating additional income. The link between pastoral production and markets could pose another bottle-neck. Therefore we shall pay attention to market relations from the perspective of animal husbandry and its products as well as from ad-

ditional resources that play a growing role for pastolists. The experiences on the Tibetan Plateau (Photo 1) will be highlighted during our field trip to Nam Tso Region. Along the route we shall vit pastoral households and a research station focusing on yak-breeding.

Following the fieldtrip will be a full day of working groups in which the input from the presentations will form the basis for mutual discussions on various aspects in the pastoral sector. The final day will be devoted to formulating recommendations tha are the expression of mutual discussion, prioritising pressing issues and identifying field for future action. The recommendations will be presented in a format that will be shared with relevant institutions within TAR.

»»» 2 Eco-Shelter Concept for the Tibetan Plateau

2.1 To build the Tibetan Plateau as an Eco-Shelter: from Policymaking to Designation, Action and Reconsideration

Fu Yao⁴, Tu Yan-li⁵, Yang Yong Ping⁶

Abstract

This paper presents a review of an ongoing Tibetan Plateau eco-shelter programme in the Tibetan Autonomous Region of China. The programme background is situated in the context of China's decision-making and the institutionalization of environmental conservation and restoration after the flood disaster of 1998. The Tibetan Plateau has an important role in the maintenance of the rich biodiversity, water resources and Tibetan livelihoods, but faces unpredictable threats and is vulnerable due to the pressures of climate change and human activities. The eco-shelter programme, based on the regionalization of highland environmental and conservation needs, is committed to a holistic regional protection and restoration plan, with a total investment of 15.5 billion Yuan over twenty years. Even if the primary results have show modest success, programme designation and implementation should be reconsidered in the context of climate change and its impacts, the application of ecosystem service payments, employment for resettled pastoralists, and conflict management between increasing tensions between wildlife and local livelihoods development.

4 Institute of Tibetan Plateau Research at Kunming, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming; Graduate University of Chinese Academy of Sciences, Beijing

5 Plateau Institute of Biology, Lhasa

6 Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing

1 Introduction

On the 18th of January 2009, the State Council of China principally approved the proposal submitted by the People's Government of the Tibetan Autonomous Region of China (TAR), to conserve and build the Tibetan Plateau as an eco-shelter. This is considered one of the most ambitious national environmental protection and restoration programmes in China. It will last twenty years, and over 15.5 billion Yuan (2.4 billion USD) will be invested. According to the final proposal (The National Development and Reform Commission, 2009), the programme was launched because of the significant function the Plateau plays in stabilizing the climatic system, maintaining water resources and hosting rich biodiversity, which was being depleted by increasing grassland degradation, desertification, soil erosion and biodiversity loss. The programme included five conservation projects (rangeland conservation; forest fire and disease control; protection of wild plants and animals and construction of protected areas; wetland protection; and development of alternative rural energy), four restoration projects (forest shelter building, grass planting, rangeland restoration, and desert and soil erosion control), and one monitoring and assessment project. It is an undoubtedly magnificent programme. In this paper, we present a review of the programme to describe the programme background, plan, primary results and some lessons learnt from previous years. Some reconsiderations and recommendations will be discussed in the end.

2 Ecological Security Construction: China's Options and Practices after 1998's nationwide Flood Disasters

It has been widely witnessed that China has undertaken rapid economic development since the 1980s, but at the same time has received intensive criticism for its environmental deterioration and pollution. It is in 1998 that China encountered a turning point, when disastrous floods took place almost all over the country during the summer, causing 1,320 deaths and 200 billion Yuan (3 billion USD) of damage. According to an investigation and examination of the case, the environmental deterioration in the upper reaches of several river watersheds, due to forest loss, grassland degradation, soil erosion and desertification, was blamed as the catalyst for the flood disaster.

Therefore, China launched two important national programmes, the National Forest Protection Programme and the National Grain-for-Green Programme. The former is to stop any kind of logging in natural forests around the upper reaches of river watersheds in China's Northeast, Northwest and Southwest. The later is focused on reforesting the steppe farmland in China's Northwest

and Southwest, through a government subsidy policy. During these years, natural forests were labeled as “green eco-shelter” or “eco-shelter” rather than only timber and firewood (Jiang 1998). Prior to 2008, China invested a total of 94.58 billion Yuan into its logging ban programme (Liu and Suo 2010), and 196.1 billion into its reforestation and grass planting programme (Zhang 2009). Meanwhile, the primary results showed great promise, with an increase of forest cover, a decrease in illegal forest logging, and a decrease in soil erosion in the project sites around the country.



Photo 1: Sheep and yak-keeping on the Tibetan Plateau
 (photograph © Hermann Kreutzmann August 3, 1998)

In 2003, China implemented a national “retire livestock and restore grassland” (Yeh 2010) project in the country’s pasturelands, as an important part of its West China Development Programme. The grassland programme was devised to reduce grassland degradation by means of a holistic approach, including the allocation of grassland usage rights to individual pastoralist households, enclosure of degraded pastureland, rotational grazing, seasonal or permanent grazing bans, grass forage plantations, and the resettlement of pastoralists in heavily degraded pastureland. The total investment from 2003 to 2010 was 13.57 billion Yuan (Liu 2010).

Apart from the Tibetan Plateau (Photo 1), the degradation and desertification of grasslands in Northeastern, Northwestern and Southwestern China were more or less alleviated. Ironically, the desertification and degradation of grasslands in the Tibetan Plateau were exacerbated at an unprecedented rate, especially in

the headwater areas of the Yellow River, Mekong River and Salween River, the so-called “China’s Water Tower” in Qinghai Province of the eastern part of the Tibetan Plateau. This threatened agricultural, industrial and husbandry sectors in the lower reaches of those rivers due to water shortages.

As a result, in 2005, a project grant of 7.5 billion Yuan was provided by the Chinese government to implement alpine grassland protection and restoration in the Southwest of Qinghai Province. In fact, China has invested billions towards environmental protection, pollution and desertification control, and restoration and reconstruction of forest and rangeland ecosystems after the disastrous floods of 1998.

The eco-shelter project in the Tibetan Plateau, approved by the Chinese government in 2009, aimed to protect the highland ecosystem, natural forests and the rich biodiversity in the Plateau, which was considered a part of the national integrated environmental protection and restoration programmes in China.

3 The Tibetan Plateau as an Eco-Shelter: Confronting the Threats of Climate Change

For many years, human activities were rebuked as the main causes leading to large-scale and intensive environmental crises such as biodiversity loss, water pollution, ecosystem deterioration and so on. However, this correlation between human disturbances and environmental deprecation was, to some extent, ambiguous in the Tibetan Plateau where local livestock decreased even more in the 21st century as compared to the 1980s and 1990s. Obviously, global climate change was another reason cited for the increasing degradation and desertification of alpine grassland in the Plateau. According to the China National Plan for Coping with Climate Change enacted in 2007 (State Council of China 2007), the annual average temperature has increased 0.5 to 0.8°C in the past 100 years in Southwest China. A series of environmental changes were witnessed in the Plateau, including the water level rise of inland lakes (Ding and Liu 1995; Bian et al. 2006), glacial retreat (Zhang 2004), grassland degradation (Li et al. 2005) and the melting of permafrost (Jin et al. 2000).

To cope with the impact of climate change in the Tibetan Plateau, the Chinese government established the Tibetan Plateau Eco-shelter programme in 2009. As described in the newly-formulated official document (State Council of China 2011), the eco-shelter programme had multiple targets, that is, protecting grasslands, wetlands and forestlands; conserving biodiversity; alleviating soil erosion and desertification; preventing natural hazards; improving protected area management; and ending water and air pollution, presenting

local infrastructure, based on the uniqueness, fragility and vulnerability of the natural ecosystems in the Tibetan Plateau in the context of climate change and human interference.

4 Conservation and Restoration: an ambitious Designation

The Tibetan Plateau is well known worldwide as “the third pole” or “the roof of the world” because of its high elevation, with an average of 4,000 meters a.s.l., and large area (Photo 2). The Tibetan Autonomous Region of China covers nearly 1.25 million km². As a result, any conservation and restoration plan must be based on regionalized and integrated analysis and clarification of the natural carrying capacities, existing threats, conservation priorities, and key development sectors of the area.



Photo 2: Tibet as the “third pole” or the “roof of the world”
 (photograph © Hermann Kreutzmann September 12, 2000)

Subsequently, three zones and seven subzones were categorized and mapped (National Development and Reform Commission of China 2009; Zhong et al. 2006). In the Northern and Western highlands of the Tibetan Plateau of TAR, an area of 811.3 thousand km², dominated by alpine steppe, alpine desert and alpine meadow, was classified as a core zone of the eco-shelter, in which only modest grazing and development is allowed in order to protect the rich wildlife and fragile ecosystems. Rotating grazing, forage planting, pastoralist resettlement and ecosystem service payments are being implemented. In the

southern mountainous region of TAR, with the dominant vegetation types of alpine steppe and alpine shrubby grassland covering 173.6 thousand km², agriculture and urbanization are the most important sectors, even if environmental restoration is urgently needed to control soil erosion and desertification. In the Eastern and Southeastern region of TAR, which is dominated by broad-leaf forest, subalpine conifer forest and alpine shrub, protection of the natural forests is the top priority for conserving regional biodiversity, reducing soil erosion and preventing natural hazards such as landslides and glacial lake outbursts. Afforestation, the reforestation of steppe farmland, and the “retire livestock and restore grassland” projects were carried out with the support of several national programmes.

In accordance with the eco-shelter programme, three important action plans were framed and are being implemented in the TAR. The conservation plan includes the protection of rangelands; the control of forest fires, pests and diseases; the protection of wildlife and plants and the improvement of protected area management; the conservation of wetlands; and the development of alternative rural energy, in particular using wind and solar energy on the Plateau. In the restoration action plan, the establishment of a forest shelter belt and artificial pasturelands, and the control of dust, sandstorm and soil erosion were highlighted. As the implementation period of the eco-shelter programme will last twenty years, a network of monitoring and assessment is being set up to evaluate the results of conservation and restoration, and the programme outcomes.

As of 2011, 2.5 billion Yuan has been invested (Dai 2011). Some of the primary results of the conservation, restoration and livelihood development are very positive, with 1.5 million hectares of rangeland and 23 thousand hectares of natural forest under protection or re-growth. Supported by this programme, 15 thousand households can access electricity, and 124 thousand households can use biogas for family heating and cooking (Laba 2010).

5 Some Reconsideration and Lessons learnt

Although the eco-shelter programme has produced some promising successes, some reconsideration needs to be made currently in terms of policy making, programme design, and programme implementation. The following issues should be emphasized and integrated into the ongoing programme action plans.

- (i) **Climate change and its impacts** on the Tibetan Plateau need be taken into account in the regionalization of the ecosystem in terms of function, threats, conservation, and restoration planning.

From historical climatic data, the trends of both temperature and precipitation within each zone or subzone are very heterogeneous and locality-dependent, which was not sufficiently integrated into the present programme action plan.

- (ii) **Ecosystem service payments** should be used as a catalyst to encourage environmental restoration rather than money distribution. After the pilot implementation of rangeland service payments in the TAR, the Chinese government institutionalized the ecosystem service payment system for grassland all over the country, starting in 2011. In addition to reducing forest logging and over-grazing, the payment needs be used in the promotion of tree and forage planting.
- (iii) **Employment is an integral part of pastoralist resettlement.** As the resettlement of pastoralist households is undertaken in the Tibetan Plateau, it will bring better access to public services, such as medical services and education. Technical training and job assignments for resettled pastoralists are important for livelihoods development and programme success.
- (iv) **Resource competition** between wildlife and livestock is now intensifying. In the Northern highland of the TAR, the booming population of herbivorous wildlife, such as Tibetan antelope, wild yak and Tibetan wild ass, is blamed by Tibetan pastoralists for threatening traditional pastoral production and livelihoods. The increasing numbers of carnivorous mammals, like brown bears, sometimes destroy houses and endanger local peoples' lives. In this case, some countermeasures should be established strategically in the programme action plan.

The Tibetan Plateau eco-shelter programme in the TAR is an ambitious national programme for environmental conservation and restoration in China, with both regional and international significance for water resources and climatic systems. However, as a long-term investment, modification or revision of the programme plan is necessary in the context of uncertainties due to climate change and human activities.

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2.2 Building the Eco-Shelter of the Tibetan Plateau

Zhang Yong Ze⁷

Abstract

This chapter illustrates the strategic position of Tibet as an important ecological shelter for the country and region from four aspects: First, the Tibetan plateau has a profound impact on the geographical patterns, and second, the stability of the climate system in China and East Asia, and third, it is an important source of the rivers of Asia, a stronghold of water security for China, and fourth, an important global gene pool and biodiversity conservation hotspot. The author summarizes the progress and effectiveness of ecological shelter construction in the Tibetan Autonomous Region of China (TAR) in three points: (i) the implementation of eco-conservation projects, (ii) the improvement of environmental quality and (iii) the ecological, economic and social benefits of the ecological shelter development projects. The author puts forward four key tasks for building a comprehensive ecological shelter in TAR: (i) to promote a balanced development model, (ii) to carefully implement well-planned projects; (iii) to establish a Payment of Ecosystem Services (PES) regime, and (iv) to effectively address environmental issues related to people's livelihoods.

1 Introduction

Tibet constitutes the main body of the Qinghai-Tibet Plateau. It has a unique, natural environment and is very rich in wildlife, water, mineral and tourism resources. With a blue sky, crystal-clear rivers and vast areas of rangelands, its ecosystems are of utmost importance. The central government identifies Tibet as an important ecological shelter for the country and therefore approved the implementation of the “Master Plan on Constructing and Protecting Tibet’s Ecological Shelter (2008–2030)” (MPCPTES). MPCPTES enshrines the protection and construction of Tibet’s ecological shelter as a key national eco-conservation project that will invest 15.5 billion Yuan in five separate five-year-plans in three major categories. It supports ten environmental protection and construction projects, with the purpose of establishing a basic ecological

7 Director General and Research Fellow of the Tibet Autonomous Region Environmental Protection Department

shelter system in Tibet by 2030. Construction of the ecological shelter has become the national strategy. It is the historical mission of Tibet and the central government to build an ecologically sound civilization and achieve balanced and sustainable development in Tibet.

2 The Strategic Position of Tibet's Ecology

The Qinghai-Tibet Plateau is often known as the “Roof of the World”, the “Third Pole of the Earth,” China and Asia’s “River Source”, the “Ecological Source”, and the “Sensor” or “Sensitive Area” for climate change in Asia and even for the whole of the Northern Hemisphere (Photo 1). Ecologically and environmentally speaking, it is a unique geographical unit. As the main body of the Qinghai-Tibet Plateau, Tibet plays an important role not only in shaping geographical and environmental patterns and stabilizing climate systems, but also in protecting water security and biodiversity. It is a strategic ecological shelter for China and Asia.

2.1 Tibet has a profound impact on the geographical and environmental patterns of China and East Asia

The bulge of the Qinghai-Tibet Plateau divides the westerly circulation into Northern and Southern branches. The Northern branch circulation intensifies the droughts in Northwest China, and even Mongolia. The Southern branch circulation brings the warm air of the Indian Ocean into Eastern China, creating the coexistence of the Pacific Ocean Monsoon and the Indian Ocean Monsoon. This then averts the possibility of the formation of deserts in China and East Asia, similar to those in North Africa and the Middle East, and forms a humid subtropical monsoon climate zone. It contributes to shaping the geographical and environmental patterns of China’s arid Northwest, humid East and arctic Qinghai-Tibet Plateau.



Photo 1: The water towers of humankind in Tibet
(photograph © Hermann Kreutzmann September 12, 2000)

2.2 The Tibetan Plateau provides a shelter to the climate systems in China and East Asia

Towering topography brings about certain special thermal processes, making Tibet one of the important sources of the convective system, causing summer floods in Eastern China. In summer, the sensible heat and latent heat effects of the plateau are so strong that they play an essential role in promoting the formation, outbreak and maintenance of summer winds. It is an important driving force of atmospheric motions in China and Asia. Underlying surface conditions, particularly vegetation and snow cover, can lead to dynamic changes, thereby affecting the stability of the atmospheric circulation in Asia and the northern hemisphere. The Plateau's dynamic and thermodynamic effects are indispensable factors in the non-uniform formation of the East Asian Monsoon water vapour distribution. The Plateau constitutes an enormous barrier against the north-south exchange of heat and water vapour. It is a "transit point" in the long-distance transport of water vapour from the low-latitude oceans, having a direct impact on the occurrence and process of the monsoon rainy season of the Yangtze River. The Plateau also has an obvious effect on the drought and flood distribution patterns and the evolution of the ecological environment in China.

2.3 The Tibetan plateau is an important source of the rivers of Asia and a stronghold of water security in China

Tibet is home to the world's most developed mountain glaciers, covering an area of 28,600 square kilometres. Tibet's glacial runoff is 32.5 billion cubic meters, accounting for about 53.6% of the national total. A total area 25,000 square km is covered by lakes in Tibet, accounting for about 30% of the national total. The Tibetan Plateau has various wetlands totalling 600 million hectares, ranking first in China. Unique alpine wetlands can also be found here.

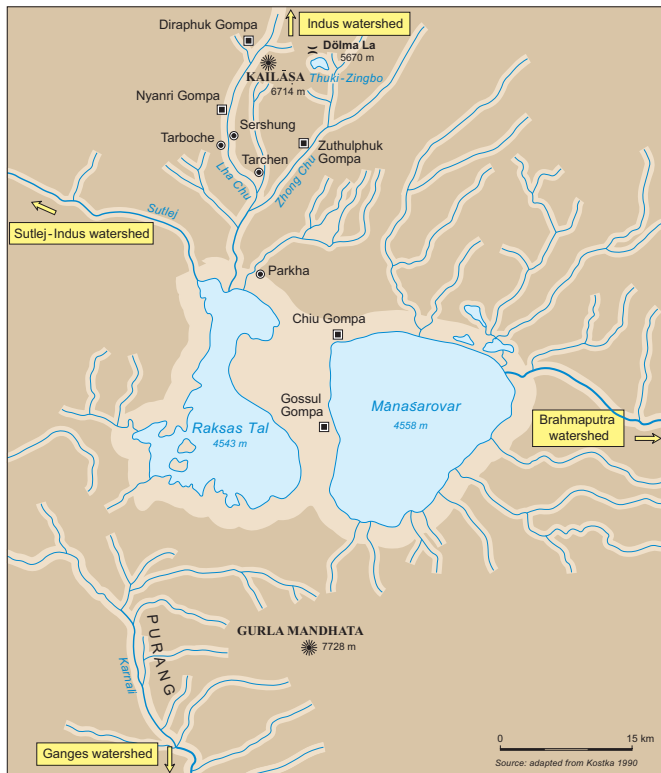


Figure 1: Water sources of humankind and sacred landscape around Mount Kailash and Mansarovar Lake (design and ©: Hermann Kreutzmann based on Kostka 1990)

Tibet's numerous glaciers, lakes, and wetlands spawn many of the important rivers in Asia, making it the source region of some of the world's largest rivers. Asia's famous Ganges, Indus, Brahmaputra (Yarlung), Mekong (Lancang), Salween (Nu) and Yangtze Rivers are all derived from and flow through Tibet (Figure 1). Tibet plays an important role in water conservation for many important rivers in Asia and in regulating river hydrology. Glaciers, lakes, and rivers contain vast deposits of water, making Tibet the "water tower of Asia". Tibet's water resources reach a total of 448.2 billion cubic meters, ranking it first amongst all provinces of China (including autonomous regions). The abundant water resources here play a critical part in ensuring China's water security. Tibet, theoretically, contains 201 million kilowatts of hydraulic power, accounting for 29% of the nation's power, of which 140 million kilowatts are technologically exploitable, accounting for 24%, ranking it first amongst all provinces (and autonomous regions). At present, most of the rivers in China have seen in-depth development and utilization of their water, whereas Tibet's water resources have yet to be developed. Tibet will be China's future energy base by providing continuous primary energy to the West-East Electricity Transmission Project.

2.4 The Tibetan Plateau is an important region for the world's gene bank and biodiversity conservation

Tibet has all types of ecosystems, except marine ecosystems, in its vast territory. The forest, rangeland and wetland ecosystems in Tibet are characterized by their diversity and their uniqueness within China, and the world. It has a tropical rain forest with the highest northern latitude in the world, a monsoon forest ecosystem and many typical Chinese-Himalayan Flora tree species. Of all the pastoral ecosystems, Tibet has a unique Tibetan alpine arid desert, alpine semi-arid steppe and alpine sub-humid meadow.

Tibet, as a unique environmental unit, gives birth to singular biological communities and a number of rare endemic wildlife species. Tibet is the world's most important genetic centres for mountain species, and is home to 25 biodiversity hot spots. Tibet has 6,530 kinds of vascular plants, of which 2,700 are endemic to China and 1,200 are endemic to Tibet. As national key protected wild plants there are 39 species listed in Tibet. It has more than 300 kinds of Tibetan medicinal herbs, and 800 species of wild vertebrates (subspecies), of which nearly 200 species are unique to Tibet. As national key protected wild animals, 125 species are listed in Tibet, accounting for over one third of the national total. In addition, Tibet has 4,000 kinds of insects, including 1,100 endemic species. Tibet is one of the world's most biologically diverse

high-altitude regions, known as the “natural gene pool of alpine organisms”. It has an important strategic position in the conservation of the biodiversity of the world.

3 Progress in constructing Tibet's ecological Shelter

The CPC Central Committee and the State Council attach great importance to Tibet's environmental protection, and identify Tibet as a strategic ecological shelter. The State Council has approved the implementation of the “Master Plan on Constructing and Protecting Tibet's Ecological Shelter (2008–2030)” (MPCPTES). MPCPTES enshrines the protection and construction of Tibet's ecological shelter as a national key ecological project that plans to invest 15.5 billion Yuan in five separate five-year-plans for environmental protection and construction, with the purpose of establishing a basic ecological shelter system in Tibet by 2030. The ten priority fields include: protection of natural rangelands, forest fire prevention and pest control, wildlife protection and conservation, protection of important wetlands, alternative energy sources for agricultural and pastoral areas, plantation of shelterbelts, artificial plantation and natural pasture improvement, desertification control, soil and water erosion treatment and ecological shelter monitoring. In recent years, the central government has made increasing investments in environmental protection and construction in Tibet, actively promoting ecological shelter construction. As a result, the region's ecological environment is now more effectively protected. According to incomplete statistics from 2001–2009, the region invested 10.2 billion Yuan in ecological protection and construction projects.

3.1 A number of key environmental protection and construction projects have been implemented

For sometime time, with the purpose of building its ecological shelter, Tibet has been implementing a number of key environmental protection and construction projects.

First, to enhance biodiversity conservation, Tibet established 47 nature reserves of various types (nine of which are at the national level). The protected area covers 413,700 square kilometres, accounting for 34.4% of the land area of the region and 27% of the country's total protected area. Tibet's 125 national key protected wild animals and 39 national key protected wild plants, as well as other important ecosystems, are well-protected in the 21 ecological areas distinguished by functions, seven national forest parks, three geological parks, and one national scenic area that have been established.

Second, to earnestly carry out the ecological protection and construction of rangeland, 41 counties in the region have implemented a rangeland contract responsibility system and contracted 5.43 million *mu* (15 *mu* equals one hectare) of rangeland to households. The rangeland restoration project has been implemented promoting the restoration and protection of 4,591 hectares of natural rangeland. Mouse and pest control has been carried out in 28 villages in eight towns of two rural counties, covering 11.85 million *mu*.

Third, to actively promote ecological forest construction, a complete ban on commercial logging of natural forests has been enforced in the whole region. We have established a forest ecosystem services payment fund, focusing on the year-round management and protection of the region's 10.112 million hectares of forests. We have implemented the Upper Yangtze River Natural Forest Protection Project in 3 counties, putting 690 million *mu* of natural forests under strict protection and relocating 2,508 farmer and herdsman households. Key reforestation projects have been implemented, planting a total of 3.71 million *mu* of forest, closing off 8.37 million *mu* of hills and shoals for plantations, and regenerating 400,000 *mu* of heavily logged natural forest. 1.1 million *mu* of farmland has been reforested.

Fourth, to develop alternative energy sources suitable for agricultural and pastoral areas, biogas systems have been installed in 155,700 rural households of 51 counties in the region, enabling 778,000 farmers and herders to use clean and convenient biogas. Implementation of the Small Hydropower Project has alleviated pressure on local fuel. The region has been promoting the use of solar cookers and solar water heaters. The installed capacity of the solar photovoltaic power plants amounts to 9,000 kilowatts.

Fifth, to gradually address the prevention and control of desertification, soil erosion and geological disasters, 64 hectares of desert have been treated. Qushui, Zhanang, Shigatse, Shiquanhe and other sand control experiments and demonstration areas have been established. 370.1 square kilometres of land has been treated for soil erosion. Measures have been taken to prevent mudslides and other geological hazards in Zhangmu town, Nyalam County.

Sixth, to launch a "Payment of Ecosystem Services" (PES) mechanism, research has been carried out on PES, and a study report on PES in Tibet has been written. This report proposes ecological compensation policies in the five areas of forest, rangeland and water conservation, and nature reserves and mineral resources development. Beginning in 2004, the Tibet Autonomous Region has been implementing the policy of "Payment of Forest Ecosystem Services" (PFES); and each year following 2009 will see a deployment of 758.46 million

Yuan from the central government for PFES. In 2009 the state allocated more than 200 million Yuan in the five counties of our region for a pilot “Payment of Rangeland Ecosystem Services” (PRES) mechanism. Starting in 2008, 470 million Yuan has been deployed to support the transfer payment policy for national key ecological function areas.

Seventh, to actively tackle climate change impact, the “Climate Change Response Programme of Tibet Autonomous Region” was formulated in order to strengthen capacity building for experts who are trained in climate change adaptation. It adheres to the principle of cautious industrial development, strictly limits high-energy-consumption and high-pollution industries and vigorously promotes the use of clean energy to reduce greenhouse gas emissions.

3.2 Efforts have been made to keep the environment in good condition

The basic national policy of environmental protection and the balance between the environment and development in decision-making have been highlighted. The TAR has identified the objective of following a balanced development path aimed at advanced productivity, high living standards and good eco-conservation, with the most important goal being to adhere to a development model in line with the characteristics of Tibet and China and balancing development and environmental goals in Tibet. The party committee and government of the TAR have held their first International Conference on Environmental Protection. The People’s Congress promulgated about ten regulations related to the environment and resource protection. “Regulation on Drinking Water Source Protection in Urban Areas of TAR” has been introduced, along with the views on environmental protection in agricultural and pastoral areas, urban areas, tourist destinations, mining areas, etc. The “Tibet Autonomous Region River Pollution Control Plan” and the “Tibet Autonomous Region Ecological Function Zoning Plan” have been approved and enforced, integrating environmental protection into economic and social decision-making.



Figure 2: Map of prefectures within TAR

Environmental management and integrated governance has been strengthened and emissions reductions and environmental protection mandates have been enforced. More than 30 environmental impact assessment programmes have been carried out. Since 2001, more than 3,700 environmental impact assessment reports have been approved for construction projects, with their implementation rate reaching 90%, and even 100%, for large-and-medium-sized construction projects. The “veto power of environmental protection” and the “three simultaneous qualifications” systems have been instituted. Environmental monitoring and regulation for 30 high-risk enterprises has been strengthened as the TAR People’s Government signed letters of responsibility with seven prefectures (cities) to control the total amount of major pollutants released during the “Eleventh Five-Year” period (Figure 2). More than one billion Yuan has been invested to accelerate urban environmental infrastructure construction, and hundreds of millions of Yuan have been invested to treat key pollution sources. On the basis of the pilot project in Lhasa, the campaign against, so-called, “white pollution” is now in full swing in the TAR. Large-scale events such as “China’s Environmental Protection Progress in the New Century – Tibet” have been organized four times since 2003, and the “Special Environmental Protection Action Against Illegal Sewage Discharging Companies to Protect People’s Health” initiative has been held six years in a row. Environmental law enforcement supervision has also been strengthened regarding mineral, water, tourism, Tibetan medicine and other resource development and infrastructure projects.

Proactive environmental management and strict environmental law enforcement supervision helps to improve the urban environmental quality and regional ecological environment. So far, no major pollution incidents have occurred in Tibet, with the region's water, air, noise, soil, radiation and overall ecological environment quality in sound condition, with most of the region still in a pristine state.

3.3 The ecological shelter construction programme has reaped obvious benefits

Tibet's ecological shelter construction programme has achieved significant ecological, economic and social benefits. First, the eco-efficiency has improved significantly. After years of afforestation efforts, the Yajiang River shelterbelts from Lhasa to Shannan to Shigatse have basically been completed, providing effective protection to farmlands and rangelands along the river. Windy weather in Lhasa, Shannan and Shigatse has been significantly reduced, and urban environmental quality improved.

The implementation of the pastoral contract responsibility system and grazing breaks for overgrazed rangelands have promoted improvement of the pastoral ecological environment of project areas and improved rangeland productivity. Take Amdo County of Nagqu Prefecture as example, after project implementation the rangeland vegetation coverage increased by an average of 18.21% and vegetation height was up from 5.72 cm to 7.64 cm. Introducing alternative energy sources to traditional agricultural and pastoral areas causes a significant reduction in the consumption of forest, shrub, grass, dung and other traditional biomass energy sources. Preliminary estimates indicate that the region has built 65,000 biogas stations, producing an annual output of 25.0 million cubic meters of biogas, an equivalent to consuming nearly 1.8 million tons of standard coal or protecting 6.3 million *mu* of forests.

Second, prominent economic benefits have been reaped. Since the beginning of the "Tenth Five-Year Plan" period, farmers and herdsmen have increased their income by approximately 1.68 billion Yuan through participatory management and protection of key forests, natural forest protection, afforestation, returning farmland to forest and pastures, nature reserve management and protection and other projects. With the Payment of Forest Ecosystem Services being fully implemented, the region has employed about 80,000 people in the management and protection of forest resources. The annual income from management and protection services increased from 43.9 million Yuan in 2006 to 450 million Yuan in 2009, an increase of 9.2 times. Since the implementation of the rangeland restoration project started, the feed and grain subsidies to farmers and herdsmen, alone, have increased local income by 207.5 million Yuan.

Farmers and herdsmen can save 1,000 Yuan in annual fuel cost because of the rural household biogas programme.

Third, early social benefits have been achieved. Ecological protection and construction projects have effectively preserved the environment, contributing to the protection of forests, rangelands, freshwater, biological and tourist resources, and laying the foundation for sustainable and balanced development in Tibet. It has promoted the change of agricultural production models, improved productivity and living conditions of the agricultural and pastoral communities, enhanced the living standards of farmers and herdsmen and accelerated the pace of building a well-off Tibet so that the majority of farmers and herdsmen can feel the warmth of the party and the state.

4 Key Tasks in Tibet's Ecological Shelter Construction

4.1 To Promote sustainable development

The main zoning programme based upon the differentiation of is being strictly implemented. Planning of population distribution, economic distribution, land use and urbanization patterns is coordinated according to the regional resources available, environmental carrying capacity, development density and the potential of existing development. Stringent requirements of environmental protection and management are put forward to promote environmental and economic development. Environmentally adapted infrastructure construction should be accelerated in key development zones to rationally utilize the environmental capacity and to promote the industrialization and urbanization process. Priority should be given to niche industries in limited development zones, under the premise of rational choice and consideration of local advantages, so as to ensure the restoration and conservation of ecological functions. The “zero development” zones are strictly protected from any development according to the laws. Any non-compliant development and construction activities are prohibited.

An integrated environmental and development decision-making approach should be adhered to. The environmental impact assessment initiative should be strengthened and implemented in mineral, water, land, and tourism resource development planning and key infrastructure planning. Hence, it is on the premise of protecting the ecological environment that resources should be rationally utilized and development and construction planned. The “veto power” of environmental protection should be conscientiously implemented, with new construction, renovation and expansion projects taking into consideration the

local economic development and environmental carrying capacity. Any project that is not consistent with the national and regional industrial policy guidelines, relevant planning, environmental zoning, or pollutant emissions and ecological protection requirements shall be resolutely shelved. The principles of cautious industrial development should be carefully upheld, and development projects related to chemicals, iron, steel, paper and other heavily polluting projects must be prohibited.

Active ecosystem conservation activities are being conducted. We are actively involved in building environmental protection model cities, eco-regions, towns, eco-villages, green schools (communities), ecological and environmentally friendly businesses and other activities. This is being done to create changes in economic development patterns in order to guide or constrain the development of some industries, to mobilize people to participate in environmental protection in the whole society and to support a good atmosphere for environmental protection and sustainable development. Efforts should be made to promote an eco-friendly Tibet through ecosystem conservation activities in order to establish a number of role models for coordinated development in different areas, at different levels and in different industries.

4.2 Careful implementation of the Master Plan

The Master Plan should be well-implemented to advance the overall protection of natural rangelands, prevention of forest fires and pest control, wildlife protection and protected area construction, conservation of important wetlands, development of alternative energy sources in agricultural and pastoral areas, shelterbelt construction, improvement of agro pastures and natural pastures, control of desertification and soil erosion, ecological monitoring of shelters and other key environmental protection and construction projects. Priority should be given to ecological environmental monitoring and regulation of mineral, rangeland, land, forest, wetland, freshwater, ecological, and tourism resource development projects, to avoid the vicious cycle of protection-construction-and-damage, and consolidate the benefits of the ecological shelter construction. Ecological shelter development will be consolidated in Tibet, together with improved production and living conditions in the pastoral areas and increased incomes for farmers and herdsmen. Local communities should be fully mobilized to participate in environmental protection projects and the construction of ecological shelters, creating a good atmosphere for everyone to engage in ecological and environmental protection.

Timely examination and evaluation of ecological shelter construction projects should be carried out. First, based on the type and characteristics of the ecosys-

tems in Tibet, we should establish an ecological evaluation index system of green shelters to determine the relevant criteria. Second, we should set up a reasonable layout of ecological monitoring sites, and gradually establish an ecological monitoring network and a comprehensive monitoring system for the implementation of the Master Plan. Third, we should conduct timely examinations and evaluations of the effectiveness of ecological shelter construction projects, especially a comprehensive evaluation of the ecological, economic and social benefits. We should prepare an assessment report for the implementation of the Master Plan. Fourth, based on the evaluation, we should resolve the problems that occurred in the implementation process and make timely adjustments to the Master Plan.

4.3 Establishment of Payment of Ecosystem Services (PES)

We will establish a Payment of Ecosystem Service (PES) mechanism and provide stable funding for building ecological shelters in Tibet. The building and maintaining of the effectiveness of Tibet's ecological shelter requires active responses from all levels of government in Tibet, and the conscientious participation of the majority of farmers and herdsmen. The PES mechanism will help mobilize the local government and people involved in agricultural and pastoral areas to engage in environmental protection work. This will surely strengthen the effectiveness of the ecological shelter construction projects.

Tibet has been making important contributions to the maintenance of essential ecological functions and the protection of national ecological security. Under development in Tibet stipulates that development should always be the top priority. It is the foundation and prerequisite to solving all other problems. Ecological and environmental protection in Tibet cannot slow down development or reduce the living standards of farmers and herdsmen. Therefore, to strengthen the cohesion and coordination of relevant ministries, we suggest that the state should take fully into account the important ecological status of Tibet, the urgency of development needs and the constraints of comprehensive protection on development.

A pilot PES project should be set up in Tibet to strive for an increase of transfer payments to Tibet. On the basis of a pilot PES for forests and rangelands, Tibet should be subsidized for its protection of national ecological security and the maintenance of important ecological functions. Tibetan forests, rangelands, wetlands, nature reserves, and water resources should all receive compensation for the provision of ecological services. First, we should improve standards for the Payment of Forest Ecosystem Services. Second, we should establish incentive mechanisms for rangeland ecological protection; incentives to expand the scope and improve the standards for conservation. Third, we should establish

payment mechanisms for nature reserves. Fourth, we should set up a pilot for wetland ecological compensation. Fifth, we should set up a pilot for water resources ecological compensation

4.4 Resolving the environmental issues that are most closely related to people's livelihoods

Comprehensive management of the environment should be strengthened. Increased prevention and intervention efforts must be made to ensure pollution reduction. Construction of urban environmental infrastructure for sewage and garbage treatment should be sped up. Environmental management along the main transportation routes, tourist attractions and other vulnerable sites should be implemented. The crackdown on “white pollution” should be enhanced and promoted. Wastewater treatment for medium-sized hospitals, hotels and restaurants should be improved. Vehicle exhaust, food cooking fumes and noise should be controlled. Urban garbage collection and disposal, waste management along transportation routes and at tourist attractions should be established and improved. Environmental issues that are most related to people's livelihoods should be prioritized.

We should adopt effective measures to protect centralized drinking water sources and ensure the safety of drinking water for urban residents. We should strengthen environmental protection for drinking water sources in pastoral areas, seek alternative energy sources in agricultural and pastoral areas, enhance the capacity of village renovation and pollution prevention and improve the overall environmental quality in agricultural and pastoral areas. We should improve our ecological monitoring capabilities, establish and improve the three-tiered ecological and environmental protection systems, including the regional, prefecture (city) and county (city, district) levels. We should focus on consolidating the institutional foundation for protection, enhancing county-level capacity building and strengthening the ecological monitoring and warning system along with the law enforcement supervision system.

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2.3 The Impact of Rangeland Ecological Shelter on Xinjiang's Ecosystem

Zhang Jianli⁸, Sun Qiang⁸, Tao Meng⁸, Ji Guangnan⁹

Abstract

The aim of this paper is to understand the impact of rangeland ecological shelter on the overall ecological environment in Xinjiang. This is done by surveying, monitoring and evaluating the main functions of the natural rangeland ecosystems, in order to estimate the values of the different service functions in Xinjiang. It will also look at the service value, and total value, of different types of natural rangeland ecosystems. The highest-value service provided by the rangeland ecosystem is the provision of meat for human consumption, worth 1.5 billion US dollars, accounting for 21.26% of the total service value. Hence, the main function of the rangeland ecosystem is the potential ecological services. The rangeland ecosystems in Xinjiang include mountain ecosystems and plain desert and oasis ecosystems, and are an essential part of the animal husbandry that is based on rangeland as its sole resource. These systems have the most extensive and the most direct impact on the ecological environment in Xinjiang.

1 Definition and Conceptualization of ecological Shelters

1.1 Concept and function of ecological shelters

Ecological shelter refers to specific ecosystems located in an area. It has a structure and function that is consistent with the specific ecological requirements of human survival and development. From this definition we may understand the ecological shelter function as the protective effects of an environment that are formed by the eco-systems and ecological processes and on which humans living inside and outside the area depend on for their existence. It is mainly reflected in the need for shelter and purification when adverse environmental factors arise, and in the protection and conservation of favourable factors by the ecosystems of the ecological shelter. Examples include the purification of contaminated water and air, the blocking of wind, soil conservation, water manipulation and biodiversity conservation functions of the forest ecosystems

8 General Administration of Rangelands in Xinjiang, Urumchi

9 Information Centre of Xinjiang, Association of Social Sciences, Urumchi

(Wang, Sun et al. 2005; Wang, Deng et al. 2005). According to China's regional ecological environment and ecological shelter development strategies, and from a practical application point of view, in order to further clarify the ecological development objectives while highlighting development priorities, ecological shelter functions will be divided into the following categories:

- Purification function
- Shelter function
- Soil conservation function
- Water manipulation function
- Bio-diversity conservation function

1.2 Forests and pastures as an ecological shelter

Pastures and forests are valuable biological resources on the planet and an important ecological shelter of the Earth. They have different functions in climatic conditions of different regions. For China, one view holds that forests are a major ecological shelter in the country because the forest can preserve water and soil and can also reduce wind by a small amount. Therefore, it was once advocated that 65% of the country's forest land should be zoned as a "conservation area". In the arid and semi-arid rangeland regions of the northwest the "Grain for Green" policy has also been generally adopted. These views remain the main trends of the day, though there is another view that "Pasture is China's largest green shelter" and "the main source for soil and water conservation", but this voice is very weak.

To clarify which of these ways of thinking is most accurate is of great significance for the creation of sustainable development strategies in China. This clarification can help prevent poor decisions from being made that might lead to a large amount of human, material and financial resources to be wasted. Analysis of the key ecological issues and the main ecological shelters can help us find the right strategy and the respective measures.

2 Overview of Pastures in Xinjiang

2.1 General information on pastures in Xinjiang

People generally believe that forests are the main terrestrial ecosystem, and natural rangeland resources are often neglected as having a role as ecological shelter. The lessons from the United States in the 1930s or the Soviet Union in the 1950s, as well as the costly “sandstorms” in China today point to the inevitable fact that natural pastures play an important role in the maintenance of terrestrial ecosystems.

Secluded in the hinterland of Asia and Europe and located in the northwest edge of the motherland, Xinjiang is situated away from the seas, surrounded by mountains. It has blocked terrains and an inland temperate or warm temperate desert climate. From north to south, the terrain structure is featured by “three mountains surrounding two basins”, the Altai Mountains, the Junggar Basin, the Tianshan Mountains, the Tarim Basin, and the Kunlun Mountains (Photo 1). Xinjiang is unusually endowed with a full range of mountains, basins, plain oases and the Gobi desert. The elevation here ranges from a low of -154 m in the Turpan Basin to an average 6,000 m in the Kunlun Mountains and the Pamirs, also known as “the roof of the world”. The unique geographical location and topographical conditions in Xinjiang, combined with the underlying platform of the Gobi Desert, not only creates a continental climate with arid dryness and an extremely fragile ecosystem, but also determines the diversity and complexity of the ecological environment and lays a foundation for the rich pastures found here.

As one of China’s main rangeland areas, Xinjiang’s rangelands are widespread and diverse. According to the survey on rangeland resources conducted in the 1980s, the region has a gross rangeland area of 57.3 million hectares, accounting for 14.6% of the national total and 34.4% of the total land area of Xinjiang.

Farmlands, forests, and rangelands cover Xinjiang. The cultivated farmlands (including gardens) cover 41.5 million hectares, accounting for 3.37% of the national total; forests cover 6.4 million hectares, accounting for 3.84% and usable rangelands cover 48.0 million hectares, which is 14.43 times more than the agricultural land and 8.06 times more than the forests. Rangelands are a renewable, natural agricultural resource and the foundation for animal husbandry in Xinjiang. In accordance with the “Criteria for Classification of Rangelands and Rangeland Systems in China”, the rangeland in Xinjiang is divided into eleven categories (Table 1), 25 sub-categories, 131 groups, and 687 types.



Photo 1: Yurt camp near Kulma Pass (4363 m) with rangelands at the foot of Mount Muztagata, Western Kun Lun Shan (photograph © Hermann Kreutzmann October 15, 2008)

Topographically, natural rangelands in Xinjiang can be divided into mountain rangeland, plain rangeland or desert rangeland. In Xinjiang, 33.2 million hectares are mountain rangeland, accounting for 58% of the total in the region; 19.4 million hectares are plain rangeland, accounting for 34% and 4.6 million hectares are desert rangeland, accounting for 8% (Xu 1993).

Table 1: The coverage of different rangeland categories in Xinjiang

Category Name	Gross Coverage (million hecwtares)	Net Coverage (million hectares)	Fresh Grass Capacity (kg/ha)
Temperate meadow steppe	1.17	1.09	37,215
Temperate steppe	4.80	4.42	16,275
Temperate desert steppe	6.30	5.81	9,975
Alpine steppe	4.33	3.86	7,665
Temperate steppe desert	4.42	3.57	8,565
Temperate desert	21.33	16.10	8,940
Alpine desert	1.12	0.80	2,550
Low-lying land meadow	6.88	6.04	34,410
Mountain meadow	2.87	2.66	58,920
Alpine meadow	3.76	3.42	29,145
Marsh	0.27	0.24	66,450
Total	57.25	48.01	20,130 on average

Source: Xu 1993: 205

2.2 Characteristics of rangeland

2.2.1 Rich and diverse resources

Xinjiang has desert rangelands in plains and a variety of well-developed and widely-distributed mountain rangelands on slopes. From the plains to the mountains, landforms, soil and climatic conditions vary greatly, and have thus given birth to various rangeland types, including: desert, pasture, meadow and marsh. Xinjiang has eleven of the nation's 18 major categories of rangelands, with 26.9 million hectares of temperate steppe desert, temperate desert and alpine desert rangeland that belong to the desert rangeland; 16.6 million hectares of temperate meadow pasture, temperate pasture, temperate desert pasture and alpine pasture that belong to the pasture rangeland and 13.5 million hectares of temperate lowland meadow, temperate mountain meadow and alpine meadow that belong to the meadow rangeland. The combination of a

variety of rangelands, which provide seasonal grazing grounds for animals, and cut-grass pastures, provides sound material conditions for rangeland animal husbandry and also for forming an important ecological shelter in Xinjiang.

2.2.2 Vast desert rangeland, fragile ecosystem, and low bearing capacity

Gross vegetation coverage and net vegetation coverage of various types of desert rangeland in Xinjiang are 26.9 and 20.5 million hectares respectively, accounting for 46.2% and 42.6% in their own classes. But the stocking level is low. It only accounts for 17% of the carrying rate in Xinjiang. 30.9% of the desert rangeland has some utilization value, while the remaining 69.1% is low quality desert rangeland with low coverage, grass yield, and grass quality. The desert rangeland ecosystem is fragile. Once destroyed, it will be difficult to recover in a short time period.

2.2.3 Rich and high-quality rangeland plants, and diverse, good-quality grazing grass

According to the rangeland resources survey of the 1980s, there were 108 families in the area with 687 categories and 3,270 species of higher plants, including 2,930 species of grazing plants. 382 of these species could be found in relatively large quantities and with high quality. Almost all the world's recognized quality grazing grasses can be found in Xinjiang, such as timothy, bromegrass, *Dactylis glomerata*, yellow clover, red clover, field peas, *Onobrychis viciifolia* and others.

3 Importance of Xinjiang's Rangelands

3.1 Relationship between Xinjiang's rangeland resources and other resources

The vast area of natural rangelands in Xinjiang is the main water conservation site and natural shelter for artificial oases. Xinjiang's environmental structure is made up of mountain ecosystems, an oasis ecosystem, and a desert ecosystem constituting an interdependent and mutually restraining whole.

The mountains in Xinjiang cover an area of 63.7 million hectares, accounting for 38.4% of the total land area. They receive 204.8 billion cubic meters of precipitation, accounting for 84% of the total and have 79.3 billion cubic meters of runoff, 90% of the 88.4 billion-cubic-meter surface water total in Xinjiang (the remainder comes from the outside). It is a runoff formation zone. The mountain ecosystems are the basis for human survival. Without mountain runoff in Xinjiang, there would be no way to survive. The oasis ecosystem takes up 4%

of the land but feeds more than 95% of the population. It is the key to prioritizing economic and social development. The desert ecosystem maintains and shelters the oasis from the outside. The three ecosystems – mountain, desert, and oasis – make an interdependent whole (Photo 2). In terrestrial ecosystems, the functions of forests are great, but are subject to specific geographic and environmental constraints. The survival condition for virgin forest in Xinjiang is poor, with only 844.7 million hectares of the mountain covered in forests (Xinjiang Forestry Department 2005; Li Hu et al. 2005), only 1.3% of the nation's total. The mountain rangeland area, which is the main vegetation in mountain ecosystems, is 33.3 million hectares, accounting for 52.3% of the total area of the mountains. It is of special significance for soil and water conservation. The plain rangeland area is 22.7 million hectares. It is an important part of the desert ecosystem and the natural shelter for the man-made oasis.

3.2 Estimation of service values of rangeland ecosystems in Xinjiang

3.2.1 Various service function values of natural rangeland ecosystems in Xinjiang

According to the field survey monitoring and estimations of the main functions of rangeland ecosystem in Xinjiang, different rangeland ecosystem functions provide different potential service values to the ecological economy (Table 2). The rangeland ecosystem can provide the highest direct annual value from meat consumption, with a total of 1.5 billion U.S. dollars. However, the proportion of the total service value is only 21.26%, showing that the primary purpose of Xinjiang's rangeland ecosystems is ecological, such as climate regulation, water conservation, accumulation of soil organic carbon, erosion control, etc.



Photo 2: Desert and pastures are close neighbours in the high-lying rangelands where animal husbandry is possible close to water supplies (photograph © Hermann Kreutzmann October 15, 2008)

The total service value contributed by the regulatory, cultural and support functions of the rangeland ecosystem far exceed that of food production for human beings. This indicates that the rangeland ecosystem service value is mainly reflected in indirect values, which make up a very important part of the entire rangeland ecosystems.

Table 2: Various service function values of natural rangeland ecosystems in Xinjiang

Survive Function	Service Value per Unit Area (USD/ha/year)	Service Function Value (million USD/year)	Proportion of Service Value (%)
Air Management	4.09	196	2.75
Interference Management	22.28	1,069	14.99
Water Management	1.55	74	1.04
Water Supply	18.65	895	12.55
Erosion Control	14.24	684	9.59
Soil Formation	0.49	024	0.34
Culture	4.32	207	2.90
Waste Disposal	21.91	1,052	14.75
Pollination	12.27	589	8.26
Food Production	31.58	1,516	21.26
Raw Material	0.52	25	0.35
Genetic Resource	-	-	-
Habitat	1.49	72	1.01
Biological Control	11.29	542	7.60
Entertainment	3.79	182	2.55
Total	-	7,127	100.00

Source: Ye and Xu 2006; Halik and Yang 2006

According to different estimations of function values of the rangeland (Table 3), the total service value of the rangeland system in Xinjiang is 7.1 billion USD. The dominant categories in Xinjiang's rangeland ecosystem include: temperate desert pasture, temperate desert and lowland meadows, with a moderate contribution to the total service value of rangeland ecosystem, making up for only 43.17 % of the total. While the area of lowland meadows, temperate pastures and highland meadows is small, they produce a higher proportion of the value of ecological services. The contribution of lowland meadows is the highest. Marsh and temperate meadow pastures have a high ecological service value per unit, but it is small in size. If we can increase the area covered by marsh and

temperate meadow pastures or protect them better, the potential for rangeland development and protection is greater.

Table 3: Per unit ecological service value and total value of various categories of natural rangelands in Xinjiang

Category of Rangeland	Service Value per Unit (USD/ha/year)	Value of Function Service (million USD/year)	Proportion of Service Value (%)
Temperate Meadow Pasture	302.2	328	4.60
Temperate Pasture	183.4	811	11.37
Temperate Desert Pasture	93.8	545	7.64
Alpine Pasture	58.6	226	3.17
Temperate Steppe Desert	95.9	342	4.80
Temperate Desert	67.9	1,093	15.33
Alpine Desert	24.1	19	0.27
Lowland Meadow	356.8	2,154	30.20
Highland Meadow	339.9	903	12.66
Alpine Meadow	181.9	622	8.72
Marsh	366.1	89	1.25
Total	-	7,132	100.00

Source: Ye and Xu 2006; Zhao et al. 2004

4 Current Situation of Xinjiang's Rangeland Resources and the Protection and Development Strategy

4.1 Current situation of Xinjiang's rangeland resources

Rangeland is an important ecological shelter in Xinjiang, but because of man-made, climatic and other reasons, degradation, desertification and alkalization are causing a serious ecological crisis in the rangelands. While 4,800 hectares of natural rangeland in Xinjiang are utilizable, currently 75% of these are degraded, 20% of this is considered severely degraded. Of the original 133,300 hectares of rangeland along the middle reaches of the Tarim River, 66.7

thousand hectares have been degraded, accounting for 50% of the total. The annual carrying capacity has declined from 1 million heads to 100,000. The Bayinbuluke Pasture covers an area of 2.2 million hectares, ranking second only to the Hulunbeier Pasture. It is the origin of the Kaidu River and home to the beautiful Swan Lake, a national nature reserve. However, overgrazing and destruction due to other reasons have imposed serious losses on the rangelands, with a significant decline in the grass yield. 50% of the pastures have shown signs of degradation and 20% of the pastures suffer varying degrees of desertification and salinization.

4.2 Protection and development strategy of Xinjiang's rangeland resources

4.2.1 The rangeland ecological replacement programme

In the face of increasing degradation of rangelands, guided by the “go West” strategy, Xinjiang has adjusted the ecological construction plans, streamlined projects, and gradually implemented the rangeland ecological replacement programme. The rangeland ecological replacement programme is guided by a new concept of ecological resources and prioritizes the specific resources and their environment advantages. It is driven by a new ecological economy, and combines issues of the environment, resources, industry, and profit-making. It is a rangeland ecological management strategy to regulate ecological patterns in a macro way. First, it is essential to recognize the self-renewal, self-repair capabilities of rangelands. Second, the strategy will form new productive forces and material bases, and establish a replacement compensation system in order to achieve self-reparation of degraded rangeland. Third, it will adjust the industrial structure, change the mode of production, increase economic efficiency, improve the farming system and support the self-healing of degraded rangelands.

The rangeland ecological replacement programme includes:

- (i) Grazing breaks on natural rangeland (complete, moderate or reduced), reducing animal husbandry and timely and orderly grazing in combination with the maintenance and substitution of over-grazed rangelands
- (ii) Encouraging high-quality-and-high-yield forage production from agro-pastures, complemented by measures necessary for rangeland improvements, compensation for reduced grass feed caused by grazing breaks, protection and sustainable utilization of grass and the prevention of further destruction

- (iii) Using fenced and improved natural cut-grass rangelands to replace degraded ones to ensure recovery
- (iv) Adopting a settlement-rotational grazing system, with shed feeding in the cold season and grazing in the warm season. Some pastures will be used in alternate seasons, and the year-round nomadic system and seasonal migration system will be replaced
- (v) Using the system of shed feeding in the cold season and grazing in the warm season to replace seasonal migrations of various forms

4.2.2 Natural rangeland restoration

Rangeland restoration is guided by the spirit of the 17th Party's Congress and a scientific outlook on development. We must enforce the Grassland Law and uphold the principle that "ecological, economic and social objectives are all important, with ecological objectives as priority". We must have harmony between the development of animal husbandry and ecological conservation, formulate effective measures according to local conditions, ensure steady progress in project implementation, combine protection and development and implement rangeland fencing and grazing grass base construction. We will enhance the capacity of the natural rangelands to resist natural disasters and for self-development. By reducing animal husbandry, we will restore ecological functions, improve productivity, change rangeland animal husbandry practices, steadily promote rangeland restoration and press ahead with sustainable development in both the pastoralist economy and the society as a whole.

(1) Rangeland restoration serves the need to maintain ecological balance, set up green shelters and promote regional economic development

Natural pastures account for 34.44% the total area of Xinjiang. They are the most important ecosystem, with multiple ecological functions such as sand fixation, water conservation, farmland conservation, air purification and beautification of the environment. They provide important green shelters for economic development and people's lives. Through pasture restoration efforts, the ecological environment of degraded rangelands can be improved, which would be very important for soil and sand fixation and the general improvement of the ecological status of rangelands in the region. Meanwhile, building the rangeland green shelter is also in line with the CPC Central Committee and State Council policy to achieve ecologically sound development in Xinjiang. Therefore, intensifying the efforts to improve the ecological environment of the rangelands has important strategic significance for promoting sustainable economic development in the region.

(2) Rangeland restoration serves the need of sustainable development of rangeland pastoralism

A good ecological environment is the foundation of sustainable development in rangeland pastoralism. Development of animal husbandry depends on ecological environmental protection and the prevention of degradation. Rangeland pastoralism is the main pillar of the local economy in Xinjiang. Overgrazing has had a serious impact on the natural regeneration of rangeland vegetation. As a result, rangeland degradation is intensifying and seriously affecting the economy. Therefore, grazing breaks, reseeding and other measures adopted in large areas of the natural rangelands can effectively improve per-unit grass yields, increase vegetation coverage, relieve livestock-pasture conflicts, reduce grazing pressures and restore and revive degraded rangelands. These measures are also conducive to curbing degradation, improving the ecological environment and the development of high-quality, high-yield, and high-efficiency pastoralism in Xinjiang. We should gradually transform the traditional grazing methods that have been determined by natural elements; adopt the new science-based mode of livestock production; transform traditional, extensive animal husbandry into modern, intensive livestock production and gradually enter a virtuous cycle.

(3) Rangeland restoration is a requirement for improving pastoralist production conditions

Natural rangeland restoration is mainly about setting up fencing and railings and reseeding. Fencing and reseeding play an irreplaceable role in protecting and improving rangelands, bettering productivity, enhancing grazing management, and achieving ecological balance in the rangelands. Although some cities and counties in Xinjiang have been fencing their pastures, the initiative is still far from popularized. Livestock production in some pastoral communities still depends on traditional, extensive grazing. Many problems exist in the management, protection and utilization of natural pastures and agro pastures, including abusive grazing, degradation, reduced productivity and so on. In the process of implementing the rangeland restoration project, measures such as fence development, enhancement of self-repair and carrying capacity of vegetation are important means to strengthening the protection and utilization of natural rangelands and ensuring the sustainable use of rangeland resources.

(4) The rangeland restoration project is implemented out of the need to maintain social stability and promote social progress

In recent years, due to various natural and man-made factors, significant degradation has occurred in natural rangelands. Animal husbandry faces deteriorating conditions, in particular, frequent natural disasters. This has seriously

restricted the sustainable development of local agricultural production and imposed hidden threats on social stability. The implementation of the rangeland restoration project creates a good foundation for all nationalities in Xinjiang to improve their production and living conditions. It is the concrete manifestation of the Party's and the State's minority policies. It is both a benevolent and empowering, enriching project. Therefore, the project is conducive to maintaining regional security, unity and long-term social stability.

(5) Implementation of the rangeland restoration project in Xinjiang has achieved remarkable results

As natural rangelands are seriously overgrazed at present, the average winter pasture forage yield has decreased by 50%, summer pastures by 55% and spring pastures by 45%. Rangeland degradation leads to structural changes in the ecosystems and the food chain, with rodents and locusts increasingly occurring in the area. Now winter pasture vegetation coverage is only 25%, with a fresh grass yield of 35–45 kg/acre.¹⁰ Spring and autumn pasture vegetation coverage is only about 35%, with a fresh grass yield of 60–90 kg/acre. Therefore, pasture fencing and a change in natural rangeland utilization patterns is a pressing task.

Implementation of grazing breaks, fencing and other policy measures, combined with biological, engineering and technical measures, have provided the project area with an effective rest. This is good for the restoration of vegetation, is conducive to biodiversity conservation and sustainable use and is good for maintaining the balance of rangeland ecosystems and enhancing rangeland productivity. Vegetation coverage in the zero-grazing area has increased from 25% to 30–40% and grass height has increased from 10–25 cm to 15–40 cm. Vegetation coverage in the reduced-grazing area has increased from 35% to 45–85% and grass height has increased from 15–60 cm to 30–80 cm. Hence the rangeland productivity and ecological functions have been effectively restored. Implementation of grazing breaks and other measures for rangeland restoration will not only improve the plantation coverage of the project area, reduce the coefficient of exposure surface and enhance the role of plant transpiration, but also change the regional water and heat conditions and create a new ecological environment. At the same time, due to vegetation growth in the project area, soil erosion is easing and the function of soil and water conservation have been restored and strengthened. The deterioration of the rangeland ecological environment has been checked.

By implementing the rangeland restoration project, establishing a high-standard forage production base on the agro-pastures and growing enough high-quality

10 One hectare equals app. 2.5 acres.

forage, the problem of serious winter forage shortage has been resolved. Meanwhile, by adopting captive feeding and breeding, traditional animal husbandry has been opened to modern changes. The rangeland restoration project has been earnestly implemented, rehabilitating the rangeland and achieving the purpose of rangeland replacement by other means. Ultimately, the rangeland ecological environment has been improved significantly.

5 Conclusions

Rangeland makes up a large proportion of Xinjiang's land resources, accounting for 86.9% of the 55.02 million ha of land used for agriculture, forestry and animal husbandry. Xinjiang's rangeland ecology affects the mountain, plain desert and oasis ecosystems. It is the basic component of rangeland-based pastoralism. It has the most direct and extensive impact on the ecological environment of Xinjiang. Through analysis, it has been found that the ecological benefits of the rangeland are as follows: air regulation, climate regulation, interference management, water management and water supply, erosion control, soil formation, nutrient cycling, waste treatment, plant pollination, biological control, habitat, food production, raw materials, genetic resources, entertainment and culture. This helps us understand the importance of the Xinjiang rangelands in regional and national eco-environmental protection, as well as for socially and economically sustainable development.

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»»» 3 Eco-tourism and Nature Protection in Relation to Pastoralism and Range- land Management

3.1 From pastoral Economy to Rangeland Economy: Capturing the Multi-Functionalities of Rangeland Resources

Yi Shaoliang and Ismail Muhammad¹¹

Abstract

Traditional extensive use of the rangelands for pastoralism is in itself well-matched with the ecological principles and non-equilibrium nature of the arid, semi-arid or high-elevation temperate systems and is therefore compatible with the objectives of nature conservation. However, the potential of the traditional pastoral use for livestock production is always limited by the primary productivity of the rangelands ecosystem which has been witnessing increasing degradation across the globe in recent decades. The sustainability and economic viability of traditional pastoralism is further weakening as a result of growing population,

11 Both authors are affiliated with the International Center for Integrated Mountain Development (ICIMOD), Kathmandu.

increased inflow of goods with greater market competitiveness, disintegration of indigenous systems and lack of appreciation among the young generation.

However, increasing recognition of the multi-functionalities and new values of the rangeland ecosystems has unfolded new opportunities to the pastoral societies. Conserving the rangelands resources to maintain healthy ecosystem services, environmental functions in particular has become the priority concerns and strategies of many governments. Rangelands are important for carbon sequestration, soil and water conservancy and biodiversity conservation. Extensive rangelands have been demarcated as protected areas for either biodiversity or watershed conservation. The remote and pristine landscape of rangelands and the seemingly romantic pastoral way of life and related culture are becoming tourism resources that can be managed to generate income sources for pastoral households and revenues for local governments. Implemented in its true sense, rangeland-based ecotourism can well harmonize the objectives of development and conservation. The rangelands are also important in producing niche products such as organic foods and vegetables and medicinal plants. This emergence of new values of the rangelands has resulted in a shift or an expansion of stakeholders and an up-scaling of impacts concerning rangelands management.

To reap the emerging opportunities and harmonize development and conservation, major shifts of “mental models” are needed among the managers and decision-makers. In the first place, a shift from “pastoral economy” to “rangeland economy” is needed to tap the multiple uses of rangelands and exploit the opportunities offered by such uses. Secondly, there is also a need of shift from “conservation” or “protection” of rangelands to “sustainable use” of rangelands resources. There are many ways in which rangelands can be sustainably used without compromising the ecological integrity and ecosystem services. Many rangelands landscapes are the product of human activities and sustainable use of such landscapes often help to maintain such landscapes and enhance the resilience of rangeland social-ecological systems.

Shifting models of rangeland uses means a transformation of the existing rangeland social-ecological systems. The recognition of the new values of rangeland resources means that more stakeholders will be interested and should be involved in rangeland management. Adequate interventions are needed to balance different interests and management objectives and build the adaptive capacity of the pastoralists and guarantee equal opportunities for all the stakeholders.

1 Rangelands as natural Resources

Rangelands as defined by Stodhart et al. (1975) include grassland, open forests and woodlands, savannahs, shrub lands, alpine meadows, wetlands, steppes and deserts and account for over 40% of the land surface of the earth (UNDP et al., 2000). Vast expanses of rangelands are found in places of the earth where rainfall (e.g. Eurasia steppe), soil substrate (e.g. savannah in Africa) or thermal conditions (e.g., alpine meadows) have made it impossible to develop natural forests or farming crops. Many rangelands belong to non-equilibrium systems the primary productivity of which show great annual variability and is frequently checked by abiotic factors such as droughts and extreme cold weather (Behnke et al. 1993). On one hand, these rangeland ecosystems constitute an important part of the nature in which human beings inhabit. On the other hand, rangelands are also resources on which human societies depend for their basic livelihood and socioeconomic and cultural development. Central Asia, Hindu Kush Himalaya (HKH) and Tibet Plateau are among the major rangeland areas of the world. In HKH-Tibet Plateau, over 60% of the terrestrial ecosystems are used as rangeland resources for extensive grazing by either domestic livestock or wildlife. The primary use of rangelands is for livestock production with the management systems varying from nomadic pastoralism through mixed subsistence farming to commercial ranching. At the global level, there are at least 20 million households depending entirely on pastoralism for livelihood (FAO 2001). In HKH region, about 100 million people derive their livelihoods directly from rangelands sources. How to manage these rangeland resources for better pastoral development has been and is still the major concern of the key stakeholders and national policies in many countries. There is also an increasing recognition that rangelands are multi-functional and are providing a wide range of ecosystem services that are of paramount importance to not only millions local inhabitants but also billions living much beyond the rangeland areas. Rangelands are attracting an escalating number of tourists and in many places tourism based on rangelands has become an important alternative income sources for pastoral communities and local revenue. Rangelands are also home to many globally significant eco-regions and hotspots of biodiversity from genetic to landscape levels. Maintaining the status of the rangelands so as to sustain their capacity to continuously provide multiple ecosystem services and goods has now become a priority concern of international communities.

2 Traditional Pastoralism: Rationalities and Challenges

Pastoralism, the use of extensive grazing on rangelands for livestock production, is one of the key production systems in the world's arid lands and temperate

rangelands. Extensive pastoral production covers some 25 percent of the world’s land area and produces 10 percent of the meat used for human consumption (FAO 2001). Pastoral production is split between the extensive enclosed systems that are typical of North America, Australia and parts of South America, and the open access systems of Africa, the Andes, Asia and Siberia, which are still largely the “province of ‘traditional’ producers”(FAO 2001).

Pastoralism in its traditional form is centred on the provision of products and services for basic subsistence. Therefore, the types of animals and the amount of animals of each type kept by each household are mainly dictated by local needs. In many remote and marginal places which are often the cases of pastoral areas, animals must perform numerous services that are provided by other ways in areas with better market accessibility and more convenient social service network. For example, in the mountains of HKH and Tibet Plateau, people simultaneously keep yellow cattle (*Taurus domesticus*), yak (*Bos grunniens*), Pian Niu (a crossbreed of Yak and yellow cattle), mule, horse (*Equus caballus*), donkey (*Equus asinus*), sheep (*Ovis aries*) and goat (*Capra hircus*) (Table 1).

Table 1: Animals and their functions in Hengduan Mountains of East Tibet Plateau

Animals	Functions
Yellow cattle	Crossbreeding with yak to give birth to Pian Niu; draught; manure; Milk
Pian Niu or Yak-cattle crossbreed (male)	Portage, draught; manure
Pian Niu or Yak-cattle crossbreed (female)	Milk; manure
Yak (female)	Milk; hair; portage; draught
Yak (male)	Crossbreeding with cow to give birth to Pian Niu; portage; draught; hair
Horses	Portage; crossbreeding to give birth to mules; manure
Mules	Portage; manure
Donkeys	Portage; crossbreeding to give birth to mules; manure
Sheep	Wool; cash; meat; milk; manure
Goats	Cash; meat; hair, milk; manure

Source: Yi et al. 2008

Holistically valuing a complex system is nearly impossible. Valuating the importance of pastoralism through market value or monetary terms is difficult and not doing justice to it simply because of the fact that pastoralism in its traditional sense was not meant for market production and that pastoralism is multipurpose and many roles or functions played by traditional pastoralism can not be measured by monetary terms. Pastoral systems are more than simply a mode of livestock production. They are also consumption systems that support 100–200 million mobile pastoralists globally: many more if extensive agopastoralists are included (FAO 2001). They are natural resource management systems that provide a wide range of services and products that are nationally and globally valued, such as biodiversity, tourism and raw materials. Scholars (Hatfield et al. 2006) have tried to assess the importance of pastoralism by taking into its direct values, indirect values, optional values and existence values.

Another dimension to the values of pastoralism is that the major resources exploited by pastoralists, that is, the rangelands are often marginal resources under harsh conditions that cannot be used by conventional agriculture. Pastoralism is a socio-ecological mode of culture (Scholz 2008). It represents a cultural adaptation to marginal environments, characterized by climatic uncertainty and low-grade resources, and complies with the ecological principles of rangeland ecosystems. It is the finely-honed symbiotic relationship between local ecology, domesticated livestock and people in resource-scarce and highly variable regions, often at the thresholds of human survival. It represents a complex form of natural resource management, involving the direct interactions between three systems in which pastoral people operate, i.e. the natural resource system, the resource use system and the larger geo-political system (Pratt et al. 1997).

For development agencies and policy-makers to support pastoralists, it is important to keep in mind that:

- (1) pastoralism represents a way of life showing how to make a survival under harsh conditions by exploring marginal and heterogeneous resources that can not be otherwise used, but pastoral way of life itself is far from satisfactory and usually does not provide a quality way of life;
- (2) pastoral use of rangelands is more compatible to ecological conservation objectives than most other land uses of rangelands; especially, many rangelands are non-equilibrium systems exhibiting high variability in primary productivity and opportunistic and extensive pastoral use proves to be far more sustainable and environmentally friendly than cultivated agriculture; we should therefore not hold the view that pastoralism is “outdated” or something that needs to be

“tolerated”; instead, it should be something to be depended and encouraged if no other ways are available; and

(3) for a long time in the future, pastoralism will continue to be an important way of resource use in the rangelands area.

Traditional pastoralism is facing daunting challenges including declining economic viability due to the lack of market competitiveness; disintegration of indigenous systems, inappropriate policy support, rangeland degradation, and lack of appreciation among the young generation(Yi et al. 2008).

3 Multi-Functionalities of Rangelands: Emerging Opportunities

3.1 Evolving rangeland values

When people use nature’s goods and services, they transform nature into a resource. The parts of nature that are valued as resources are relative to a particular culture or period of time. Similarly, values of the same parts of nature evolve over time depending on the understanding, priority concerns of human beings and technology level. As is shown in Table 2, much more values have been attributed to the rangelands than before when rangelands were mostly conceived as a resource for pastoral development.

Table 2: Evolving rangeland values

Traditional Values/functions	Present Values/functions
Habitats	Habitats
Fodder resources	Fodder resources
Religious sites	Religious sites
Medicinal plants	Medicinal plants
Fire woods	Fire woods
	Recreational venues/aesthetics
	Water and soil conservancy
	Biodiversity conservation
	Carbon sequestration
	Niche products

Source: compiled by authors

This multi-functional nature of the natural ecosystem was reflected in the Millennium Ecosystem Assessment (Millennium Ecosystem Assessment 2003) which summarized the various goods and services provide by natural ecosystems such as rangelands.

Recognizing this multi-functional nature of rangelands, the XXI International Grassland Congress and the VIII International Rangelands Congress (Organizing Committee 2008) was held in Hohhot of China in July 2008 with the theme of “Multi-functional Grasslands in a Changing World”.

In recent years, many methodologies, models and approaches have been developed to estimate the holistic value of natural systems like rangelands. Especially, after the publication of the Millennium Ecosystem Assessment (2005), people have been trying to calculate the goods and services of ecosystems in monetary terms and market values using various indicators and methods. One study (Xie et al. 2003) has put the total values of goods and services provided by ecosystems on Tibet Plateau around 138.7 billion USD, over 48.3% of which is from rangelands (Table 3).

Table 3: Annual values of ecosystem goods and services of Tibet Plateau

Goods and services	Total Value (in billion USD)	% of total
1 Total	138.72	100.0
2 Soil preservation	26.70	20.0
3 Water conservation	22.84	16.3
4 Maintaining biodiversity	22.22	16.0
5 Regulating air	14.57	10.5
6 Regulating climate	14.70	10.6
7 Disposing Wastes	23.03	16.6
8 Food	3.61	2.6
9 Providing raw materials	5.55	4.0
10 Recreational and cultural values	4.72	3.4

Source: Xie et al. 2003

In sharp comparison, the total GDP and agricultural share of GDP of Tibet Autonomous Region and Qinghai Province in 2009 was only 22.7 billion USD and 0.25 billion USD respectively (Statistics Bureau of Tibet 2010; Statistics Bureau of Qinghai 2010).

3.2 Rangelands for nature conservation

Considering the global extent of distribution, rangelands are important habitats of biodiversity, ranging from genetic to landscape levels. Especially, in HKH, Tibet Plateau and Pamirs, alpine meadows constitute the bulk of rangeland resources in many places. These alpine meadows, due to its isolated habitats, are especially rich in endemic species. From HKH to Pamirs, there are at least four globally significant biodiversity hotspots (Conservation International 2007). As mentioned previously, rangelands are mostly in arid, semi-arid or cold regions where rangelands play a critical role in conserving water and soil and maintaining the ecological stability. In HKH and Tibet Plateau, rangelands are the source areas of over ten major rivers in Asia such as Yangtze, Mekong and Ganges and therefore the proper functioning of these rangeland ecosystems will have great impacts on the hydrological process of regions far beyond the boundaries of rangelands.

To conserve the rich biodiversity resources and enhance the ecological functions of the ecosystems, over 1.6 million sq. km or 39% of the total area of HKH has been designated by the national governments as protected areas. Some of the world's largest nature reserves or protected areas are in the rangelands areas such as the San Jiang Yuan Nature Reserve and Changthang Nature Reserve in China (Table 4).

Table 4: Some of the large protected areas covering the rangelands of HKH

Name	Size (ha)	Source
A Er Jin Shan Nature Reserve (Xinjiang, China)	4,500,000	Du (2004)
San Jiang Yuan Nature Reserve (Qinghai, China)	36,300,000	Baidu (2010a)
Qiangtang Nature Reserve (Tibet, China)	29,800,000	ICIMOD(2010)
Kekexili Nature Reserve (Qinghai, China)	4,500,000	Baidu(2010b)
Korakoram Sanctuary (India)	500,000	ICIMOD(2010)
Annapurna Conservation Area (Mustang, Nepal)	762,900	ICIMOD(2010)

The importance of rangelands in soil preservation and water conservancy is of particular relevance to China. The Chinese mainland tilts from northwest to southeast. A virtual line more less corresponding to the Hu's Line (Baidu 2010c; Sen 1989) extending from northeast to southwest divides Chinese territory into two distinct parts: pastoral region in the west where natural rangelands are the main landscape and farming area in the east that was dominated by cultivated

farming landscapes. As topographically the landmass of China tilts from west to east, this makes the rangelands in the west (accounting for about 41% of the of China's land territory) extremely important since they are the upper-stream areas of most of the major rivers of China.



Source: Baidu 2010c; Sen 1989

Figure 1: Division between pastoral and agricultural regions of China

3.3 Rangelands as an important carbon sink

With the global concern of climate change, increasing attention has been directed to the contribution and potential of rangelands in carbon sequestration. Well-managed rangelands can act as a carbon sink by fixing and storing carbon in the biomass and soil. It is estimated that rangelands store 572.6 billion metric tons of carbon, accounting for 33%–34% of total carbon fixed by the global ecosystem, only secondary to the forest ecosystem which accounts for 39%–40% of the total carbon storage. The rangeland ecosystem in China is said to have a carbon stock of 44.09 billion metric tons and 51% of it is contributed by alpine or temperate meadows, steppes and grasslands (Guo 2010). In rangeland ecosystem, over 90% of the carbon is stored in soil and less than 10% is stored in the biomass. Fang et al. (2008) calculated the biomass carbon stock of rangelands in Qinghai, Tibet, Inner Mongolia and Xinjiang and concluded that the total biomass carbon storage is about 0.536 billion metric tons. On the other hand, degraded rangelands have lower carbon fixing and storage capacity and could eventually act as a source of greenhouse gas once the thresholds are exceeded. Land reclamation and overgrazing are major causes for decrease of rangeland's carbon storage capacity. By 1998, over 660 million ha of rangelands have been converted to farming lands worldwide by human beings, resulting in a

decrease of 19 billion metric tons of carbon storage capacity. Between 1850 and 1980, the earth has lost about 10 billion metric tons of carbon storage capacity due to rangeland conversion. In China, 19.3 million ha of rangelands have been reclaimed for agriculture between 1949 and 1999, causing a loss of 30%–50% of soil carbon.

From ecosystem management point of view, it is important to know that rangelands can easily shift from being a carbon sink to a source depending on the health status of the rangelands. It is therefore extremely necessary to understand the threshold or the tipping point at which a regime shift of rangeland ecosystem could occur. Management activities should aim at maintaining or enhancing the carbon storage capacity of the rangelands. Some researchers believed that restoring the rangelands could increase carbon storage by 3.16–6.60 billion metric tons in China. Meanwhile the huge potential of improving rangeland management for carbon storage also means great opportunities for pastoral communities to benefit from carbon trading initiatives.

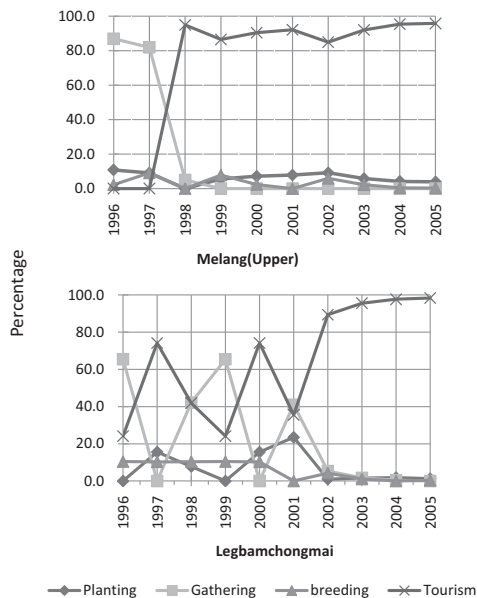
3.4 Rangelands as important recreational venues

With the acceleration of urbanization, the increase of the middle class in cities and improving accessibility, rangelands have become one of the most attractive venues of recreation for people who wish to go back to the simplicity of nature. People come to the rangeland area to enjoy its rich flora and fauna, unique, idyllic and ever-changing landscapes, diverse ethnic cultures and extreme hospitality of pastoralists or to experience the harshness, remoteness and wildness of nature. Corresponding to the migration of labourers from pastoral areas to the cities for off-farm employment, there is an equally impressive influx of city people into the rangelands each year for recreation, learning or simply retreating from bustling city life.

This increasing enthusiasm of tourism in the rangeland areas has created new income-generating opportunities for pastoral communities. Governments of various levels have been trying to capture such opportunities to transform local economy. In China, Tibet AR, Qinghai, Xinjiang AR, Inner Mongolia AR and West Sichuan have all made rangeland-based tourism development as their major economic pillars for priority investment. In many places, the share of tourism incomes has been increasing constantly in the household economy and local revenue. This increase in tourism incomes is causing a major shift in local economic structure and a redistribution of rural labourers.

Upper Melang and Legbamchongmai are two ‘natural’ villages in Northwest Yunnan Province. As is presented in Figure 2, tourism reception in these two vil-

lages started in late 1990s. Before 1998, gathering caterpillar fungus (*Cordyceps* spp.) and matsutake mushroom (*Tricholoma matsutake*) was generating close to 90% of the cash incomes of the villages. Starting from 1998, tourism reception becomes the major cash contributor and is gradually replacing other activities. As a matter of fact, traditional pastoralism stopped in the village in 2005. In Legbamchongmai, before 2002, tourism reception, gathering, animal breeding and planting all contributed more or less equally to the village incomes. But starting from 2002, tourism began to replace other activities by taking away the village labourers and becomes the only sources of cash income.



Source: based on fieldwork by Yi 2006 in Melang and Legbamchongmai Northwest Yunnan

Figure 2: Changes in cash income composition

3.5 Ecotourism as an approach to integrating development and conservation objectives

As is discussed in previous section, tourism has emerged as a growing business in rangelands area and many local communities and governments have been keen to capture such opportunities to transform local economy. Comparing to other enterprises such as pastoralism, gathering and mining, all being common

economic activities in rangeland areas, tourism as a whole is more compatible with principles of nature conservation and environmental protection since it is usually not based on the direct removal or consumption of natural resources. At the same time, tourism generates local employment. In this sense, it is an ideal approach to integrating development and conservation objectives. However, if managed improperly, the negative impacts of tourism activities on environments could also exceed the capacity of the environment to absorb. As the numbers of tourists grow, so does the interest in seeing new places and seeking new experiences. On some locations it is obvious that tourism can have negative impacts. Poorly planned and managed tourism may damage the same wildlife, natural or cultural resources that draw the tourists. In this way tourism will not be sustainable. Therefore, even for tourism development, following the ecological principles is extremely important.

Two concepts, nature tourism and ecotourism, that are frequently and sometimes intentionally indiscriminately used by developers, should be distinguished for theoretical as well as for practical purposes.

Nature Tourism is a form of tourism that involves travelling to relative undisturbed or uncontaminated natural areas with the specific objectives of studying, admiring, enjoying the scenery, its wild plants and animals, as well as any cultural areas.

By contrast, *Ecotourism* is a form of tourism *with low impact* on the environment and wildlife due to the *environmental friendly tourist services and behaviour of the tourists* (e.g., low energy use, low pollution, and low disturbance) and due to careful selection, siting and area zoning, design and use of materials of tourist facilities and respect of local cultures. Ecotourism is “*responsible travel to natural areas that conserves the environment and sustains the well-being of local people*” (The Ecotourism Society 1991). It is a sustainable development tool. Ecotourism shall comply with the principles of:

- (1) Conservation: Environmentally sound development, and no degradation of the resource allowed; contributing to conservation of biodiversity; ecologically, economically and socio-culturally sustainable; although conservation of nature is its fundamental criterion small impacts on the environment occur;
- (2) Education: Education about biodiversity and habitats is an integral component for both communities and tourists; building environmental awareness through the nature experience;
- (3) Participation: Sustains the well-being of local people; local ownership and business opportunities for local communities is promoted;

local communities must be able to share equitably in the benefits of ecotourism; income for local people should be guaranteed and sustainable

4 The Need for a Shift in “mental Models”

“Mental model” or the way people perceive nature and natural resource, often shapes the way human beings interact with their environment. For the sustainable use and management of the rangeland resources, a shift of such “mental model” is needed in the following aspects that are of most relevance to the topic of this paper:

4.1 From “pastoral economy” to “rangeland economy”

As is pointed out previously, the primary and traditional use of the rangelands is for livestock production, through either sedentary management or nomadic pastoralism or a combination of both. For most of decision-makers, rangelands are still nothing but marginal resources that are only good for human beings as a supplier of fodder for domestic animals. Therefore, all the programmes, investments and policies for rangeland areas are focused on how to obtain the maximum output of livestock products.

However, even with the best technological interventions, there is a limit to the potential of the traditional pastoral use for livestock production as it is eventually determined by the primary productivity of the rangelands ecosystem which has been witnessing increasing degradation across the globe in recent decades. With the increase of human population both within and without the pastoral areas, the number of domestic animals has seen a steady increase globally over the past centuries. Even though technological advancement has to some degree increased the efficiency of rangeland use, this increase could not compensate for the increase in fodder demand as a result of the greater animal number because the primary productivity of the rangelands of the world has seen little increase and has actually in many cases decreased due to over-grazing, land conversion or climate change. The sustainability and economic viability of traditional pastoralism is further weakened by negative impacts from external market competition and modernity process,

Therefore, if we wish to continue increasing the incomes of the pastoralists and enhance the resilience of pastoral communities, we have to think beyond livestock production. More efforts should be made to cash on the multifunctionalities of the rangeland resources as a provider of multiple public goods and services. To achieve this, there is an urgent need for a shift from a *Pastoral*

Economy that sees rangelands primarily as a resource for livestock production to a *Rangeland Economy* that emphasizes exploring the multiple functions of rangelands for regional economy development (Table 5).

Table 5: Realms of rangeland economy

Multiple Values of Rangelands	Economic Opportunities
Traditional Values Habitats Fodder resources Religious sites Recreational venues/aesthetics Niche products/Medicinal plants Carrier of traditional knowledge	Pastoralism/Modernized livestock keeping Trading native products
New-added Values Recreational Values Water and Soil Conservation Biodiversity Conservation Carbon Sequestration Niche Products Solar/ wind fields	Tourism Industry Payment of Ecosystem Services (PES) Schemes Carbon Trade Organic Food/Vegetable High Value-added Products Traditional Pharmacy Solar/wind energy generation

Source: compiled by authors

Therefore, with the new emerging opportunities and new values added to the rangelands, it is important that a holistic approach/perspective be employed to develop a rangeland economy built not only on pastoralism, but also, and even more importantly, on tourism industry, development of organic foods and vegetables and products with high added values, PES schemes, international or national mechanisms for carbon trade so as to explore the multiple values of rangelands. If we can change our “mental models” to focus on the multiple goods and services provided by the rangelands, we may find that pastoral production would not be the core, but rather, only a part of rangeland management. This will greatly broaden our vision of rangeland management.

4.2 From “protection or conservation” to “sustainable use” of rangelands

There is also an urgent need for a shift of the “mental models” of the policy-makers from the “protection or conservation” to the “sustainable use” of rangelands.

The realization of the importance of rangelands in environmental conservation does not always bring good news to the traditional user communities. Instead, many large protected areas were set up in the rangelands area by excluding or restricting the traditional uses at the expense of the pastoral communities. Many national programmes aiming at restoration of degraded rangelands also have a tendency to overemphasize the measures of protection.

This approach to rangeland conservation often leads to negative political, socioeconomic and ecological consequences. In the first place, it often causes the displacement of indigenous people or restriction to or even total deprivation of their right to the sole resources on which they have been depending on for their livelihoods for generations, frequently resulting in political conflicts between the governments and the pastoralists fighting for their rights. In the second place, deprived of access to rangelands resources, local communities often have to make a living with more limited resources which often means a decrease in their quality of life. It often takes generations for the herders to transform and adapt themselves to the changes. Thirdly, the ecological consequences of such approach also merit serious thinking. Most of the rangeland landscapes are a product of co-evolution of human activities and natural process. In particular, rangelands in the timberline zone of HKH have to a large degree been shaped by human uses. The vegetation pattern and biodiversity of such rangelands have been created and maintained by human activities mainly grazing which have a great impact on the ecological process of the rangelands. Therefore, exclusion of human uses from these landscapes may produce unintended consequences and may actually harm the biodiversity we may try to protect (Yi et al. 2007). Given the often large size of most of the protected areas in rangelands, the scale of such impacts should not be ignored.

“Sustainable use” means the way or type of use that could sustain the rangelands resources and enable the rangelands resources to continuously provide multiple ecosystem services and goods. Keeping this in mind, as long as the use of rangeland resources does not harm its functions to provide ecosystem services and goods including conservation, such uses should be allowed. In practice, it is always possible to find a balance point where the objectives of economic development and nature conservation can be integrated.

5 Key Challenges and Issues needing special Attention

5.1 Balancing multiple management objectives and multi-stakeholders' interests

Recognizing the multi-functional nature of the rangelands denotes that there are multiple management objectives and different stakeholders whose needs and interests need to be harmonized for sustainable use of the rangeland resources. Not only more stakeholders are involved, the geographic or social scale of the issue is also expanding. For example, when the rangelands are mainly seen as a fodder source for pastoral development, the importance of the rangelands is more or less limited to local scale and the stakeholders are more confined to local communities. However, when the rangelands are seen as a potential sink for carbon sequestration, the scale of the issues suddenly expands and its importance attains global nature (Table 6). This expansion of the stakeholders and the scale of the issue brings about both opportunities and challenges to the management of the resources. For example, less land is now available for grazing due to conversion of rangelands into protected areas has precipitated an increase in the number of park-people, human-wildlife and other conflicts.

Table 6: Management objectives, stakeholders and scale of impacts

Values/Functions	Stakeholders	Management Objectives	Scale of Impacts
1. Fodder Resources	Pastoralists Government (department of livestock production) Livestock product Consumers	Maximum sustainable yield of quality livestock products	Local/national
2. Traditional medicines/ niche products	Local collectors Local producers Traders Governments Consumers	Enhance and maintain the capacity of the rangelands in providing medicinal plants and niche products	Local/national
3. Religious sites	Believers Cultural departments	Maintain the sacredness of the rangelands	Local/national/ regional/global

4. Recreational venues/ tourism resources	Tourists Tourism management departments Local entrepreneurs	Earn maximum tourism incomes Maintain aesthetic values	Local/national
5. Water and soil conservation	Down-stream area residents Hydropower plants Local residents Agriculture sectors Global communities	Enhance or maintain the capacity of the rangelands in water and soil conservancy	Local/national/ regional
6. Biodiversity conservation	Global communities Local residents	Maintain biodiversity	Local/national/ regional/global
7. Carbon sequestration	Global communities	Achieve maximum carbon-storing capacity of the rangelands	Global
8. Solar/ Wind Energy Generation	Power companies	Generate electricity	Local/national

Source: compiled by authors

It is essential that participatory or collaborative decision-making mechanism be adopted to balance the needs of all the stakeholders involved and integrate the different objectives of management and achieve the multiple values of the resources. Conservation or tourism development strategies need to be sensitive to the needs of the local people and their livelihoods.

5.2 Enhance the adaptive capacities of the pastoral communities to capture new opportunities

Shifting from traditional pastoral uses of rangelands to a new modality of managing rangelands for multiple goods and services often means drastic disturbances to or transformations of the social ecological system. It is therefore

extremely important to enhance the adaptability and resilience of the local stakeholders especially the pastoralists through training, networking, funding, information provision and enabling policies so that they can cope with the changes and capture the emerging opportunities for successful reorganization and socioeconomic transformation.

5.3 Equitable sharing of benefits and community-based tourism and conservation

Shifting from a “livestock production-focused” to a “multi-function-oriented” modality of rangeland management will result in a redistribution of opportunities and social wealth and social restructuring. Not every stakeholder (group) is equally exposed to the new opportunities and neither can each stakeholder (group) catch the same opportunities exposed to them. This new political relations among the stakeholders will alter human interactions with the natural environments. It is therefore important that appropriate strategies be adopted and mechanism be established to guarantee an equitable sharing of the benefits from the multiple uses of the rangelands resources. The relevancy of this issue should be considered at two different scales: at local scale, it is important that all the members in the local communities has an equitable participation in and sharing of benefits from the emerging opportunities such as tourism development, nature conservation and PES schemes; at a broader scale, local communities should be empowered through capacity building and appropriate governance and institutional structure to bargain with the stakeholders beyond local boundaries for their benefit.

5.4 Monitoring changes in rangeland ecosystems

Human beings and ecosystems interact with each other. Changing human uses of the ecological system will trigger changes in the ecosystems which will in turn lead to changes in the goods and services provided by the concerned ecosystems which will in turn impact human decisions. It is therefore needed to closely monitor the trajectories of the local socio-ecological systems. In one way, tourism development should be carried out with a sound understanding of the environmental carrying capacity. On the other hand, the natural landscape of the region is a result of millennia of interactions between human beings and the nature through pastoralism and the role of pastoral activities in maintaining the biological diversity at all scales of the region should be properly recognized and maintained. Changes in the rangeland ecosystem as a result of changed human use patterns should be closely monitored.

6 Conclusions

Rangelands are not merely resources for livestock production. More often than not, the role of rangelands in environmental conservation outweighs their roles in economic development. This realization of the multi-functional nature of the rangeland ecosystem has greatly expanded the scope of values of rangelands and presents a good opportunity for a shift of rangeland management objectives from a “pastoral economy” centred on livestock production to a “rangeland economy” built on the multiple goods and services of rangeland ecosystems. Pastoral communities are traditional users but this does not mean that they are always in better position in negotiation with newly-added interest groups. Multi-stakeholder participation in rangeland management is becoming increasingly necessary and important to harmonize different management objectives and coordinate the interests of different groups. Necessary policies, governance structure and institutional setups are needed to guarantee that the pastoralists are the true beneficiaries not victims of larger-scale causes such as environmental conservation. If well designed, ecotourism could well integrate development and conservation objectives. Necessary supports should be provided to the pastoral communities to enhance their adaptability and resilience and help them to achieve successful socioeconomic transformation.

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3.2 Rangeland Management and Eco-tourism

Narendra Lama¹²

Abstract

Upper Mustang is one of the sparsely populated districts of Nepal, covering 2,567 km². Much of it is dominated by pastures. Forbidden to visitors for centuries, Upper Mustang was opened in March 1992, by the government, for controlled and regulated, high-value tourism. Upper Mustang falls under the jurisdiction of Annapurna Conservation Area (ACA) under the management of the National Trust for Nature Conservation (NTNC), one of the leading non-governmental organizations dedicated to conservation and development. ACA, the largest conservation area in Nepal, was initiated in 1986, in an effort to balance nature conservation with the local people's needs, while also improving their livelihoods. Since the inception of Annapurna Conservation Area Project (ACAP), its primary focus has been on integrated conservation and development programmes. These programmes emphasize: resource conservation, infrastructure development, agriculture, health service, women's development, alternative energy, the promotion of eco-tourism and conservation awareness.

Upper Mustang has a substantial share of rangelands. Increasing degradation of the pastures imposes a severe threat to the sustainability of the local herders' livelihoods. Thus, tourism could be a supplementary asset for their livelihoods, along with animal husbandry. The nomadic lifestyle, culture, landscape and pasture, as well as traditional herding sites can be marketed as tourism products, offering new travel destinations. Livestock herders can be motivated to diversify their livelihoods from low value at a higher volume to high value at low volume. For instance, they can produce milk for cheese or butter or produce *pashmina*.

12 Research Officer at the National Trust for Nature Conservation, Annapurna Conservation Area Project



Photo 1: Landscape in Upper Mustang
(photograph © Narendra Lama)

The government has assigned a high priority to the road networks around Upper Mustang, which could also have a great impact upon the mode of tourism there. Once the rural areas of Mustang are connected by the road on a year-round basis, an increased number of pasture areas that are presently solely devoted to animal husbandry can be developed as tourism destinations. This would provide tourists with side trips to experience new modes of life and the nature of the pastures. The rangelands also have tourism appeal, as they offer tourists the potential to observe endangered species such as the snow leopard, brown bear and frequent herds of blue sheep and other fauna.

1 Introduction

Upper Mustang lies between 28°47' to 29°19' N and 83°28' to 84°15' E in Mustang District, which is a sparsely populated district of Nepal (Photo 1). Upper Mustang with a fragile landscape is drained by the main Kali Gandaki River and its tributaries in the high altitude steppe. It falls in the rain shadow of Dhaulagiri Himal and Annapurna Massif and covers an area of 2,567 km². Upper Mustang consists of seven Village Development Committees (VDC) and thirty-one settlement areas (Figure 1). Upper Mustang is dominated by

pastures, but the prevailing harsh climatic conditions do not permit the growth of sufficient grass.

Agricultural production in the area is very limited due to a scarcity of water, a lack of proper irrigation, low temperatures for long periods and the low rainfall. Only 1.7% of the land is cultivable and the average landholding is 0.35 ha per person. The majority of the land is uncultivated and barren. The local food production meets only 55% of subsistence needs and only eight percent of the 5,700 inhabitants of Upper Mustang are self sufficient in terms of grain (Thakali 1994).

Animal husbandry is the main source of income for the local people. Cattle, yaks, dzos, sheep, goats, horses, mules and donkeys are the major livestock reared. Goat and sheep trading from China is also a common practice among the local population. Therefore, the proper utilization and management of this important rangeland is crucial for the long term conservation of the biodiversity of the area.

2 Rangeland in Upper Mustang

In Upper Mustang, rangelands cover more than 98% of the total land, consisting of 48% natural vegetation and 50% bare land (LRMP 1986). Both domestic and wild animals intensely use these rangelands. As a result, the condition of these rangelands is deteriorating continuously because of over exploitation by the increasing number of livestock. Altogether 286 different pasture units have been identified in the seven VDCs of Upper Mustang. The total area covered by the pasture units is 1,428 km². This accounts for 55.65% of the total area of Upper Mustang (Pasture mapping UMBCP, 2006). Pasture management is based on traditional practices and management decisions are mostly made by the village *Mukhiya* rather than the VDC council. The average livestock density in the pastures of Upper Mustang is 26.64 per km² (Pasture mapping UMBCP 2006). Based on herders' perceptions, 47.36% of the total pasture area has high grazing pressures, 39.68% has medium pressure and 12.95% has low pressure. The uprooting of shrubs and dung collection are very common in the area in order to fulfil the demand for fuel (Pasture mapping UMBCP 2006). In comparison to the past, the general conditions of all pastures are in a downturn. The situation is getting worse in higher and lower temperate pastures (dry steppes) as compared to than pastures in alpine regions (alpine pastures are still productive). Less forage availability, gradual replacement of long growing perennials with short growing annuals, the presence of unwanted and unpalatable species, etc. are some of the important characteristics of the downturn in temperate pasturelands. One of the herders claimed that the

weather is becoming less predictable now than before. There has been a general shift in both rainfall and snowfall, with both being delayed. Early rainfall in Jestha Ashadh (May–June–July) is always better for pasture growth and forage availability. Likewise, early snowfall is less harmful than late snowfall for the animals.



Source: map provided by ACAP

Figure 1: Annapurna Conservation Area Project – UCO Lomanthang – CAMCs

Farm animals in Upper Mustang mainly consist of yak (*Bos grunniens*), Chauri/Dzopa (a yak-cattle hybrid), cattle, horses, mules, Sheep and goats. Raising livestock is the only major source of cash income and livelihoods, and helps satisfy agricultural needs and fuel needs for approximately 5,700 people of Upper Mustang.

3 Agro-pastures and Rangeland Conditions

By now, more than 70 different plant species including graminoids, forbs and shrubs have been ecologically recorded in dry grasslands, *Lonicera* community,

wet meadow, dry meadow and desert steppes in Mustang Himalaya. However, only a few of them are important for grazing. *Medicago falcata*, *M. sativa*, *M. littoralis*, *M. truanicutula*, *Pennisetum flaccidum*, *Elymus nutans*, *E. sibericus*, *Agrostis sp.*, *Carex sp.*, *Kobresia sp.*, *Poa sp.*, etc. are some of the forage species occurring in the bunds, terraces and farmlands. Likewise, *Caragana gerardiana*, *C. brevispina*, *Astragalus sp.*, etc. are some of the important rangeland species with grazing value that grow in the desert steppes between 2500 m to 4500 m. Both these categories are indigenous to the area. However, a lot of emphasis has been put on the introduction of exotic species, like white clover, red clover, Cocksfoot, rye grass, etc. during the 1980s and 1990s. These were established only under well-maintained watershed conditions but failed in water stressed and high grazing areas. Therefore, indigenous species should be given high priority for augmentation and increased coverage to cope with the demand of both animals and rural people.

3.1 Resources use Conflict

Because of the uniqueness of the society and the strong institutional structure within the community, fewer conflicts over rangeland resources have been observed in Mustang, in general and in Upper Mustang in particular. However, due to heavy trade and the trafficking of animals from Tibetan Autonomous Region (TAR) to the lowlands of Nepal (e.g. Pokhara and Kathmandu), serious problem have been caused over grazing resources. This is particularly true in VDCs of Choser, Chhonup and Surkhang, as these are used as trafficking routes for the animal trade. Reportedly, such animal trade is of two types. One category includes young animals being purchased from TAR and reared up to a marketable age in these areas and finally sold to the markets in Nepal. The other category is the direct purchase of animals from TAR that are sold within a month or so to the aforementioned markets. As reported by the farmers concerned, the trade transaction goes up to 70,000 heads per year. The intensity of such trade is highest during September and October. Such animal trade exacerbates the on-going pressure on grazing resources in these areas. Therefore, conflicts over resource uses arise between the two groups in the community: traders and non-traders. In order to mitigate the situation, the non-traders' group suggested that all their rangelands should be grouped into two categories – summer and winter – depending on the aspect of slopes and the amount of forage available. Animals and the use of resources should be regulated by the concerned VDCs.

3.2 Is Cow Dung used for Fuel really depleting Nutrient Pool of Rangelands?

The collection of yak, cattle and horse dung from rangelands and agro-pastoral areas is a common practice in Upper Mustang in particular. The collection of dung is primarily done during the fall (September and October) when the rain-falls end. Many people believe that most of the soluble nutrients from the faeces have been released by then. Additionally, the dung of these animals is poor in nutrient content as compared with the dung/faeces of small ruminants. The amount of nutrients in the dung is proportional to the quality of feed ingested, which is dependent on each animal's selective behaviour. Sheep and goats are more selective than cattle. Thus, people on one hand use cattle and horse dung for cooking, and on the other hand, they use the manure of *Chyangra goth* (goat) and human excreta (night soil) from the settlements as manure for the fields. Herders sell or barter both kinds of dung; one for cooking and the other for agricultural manure. In this way, this practice compensates for the loss of animal dung used as fuel. In this way it acts as a supplement to maintain the fertility status of soil in Upper Mustang in areas where otherwise the nutrient pool of rangeland ecosystems would be depleted. The manure from small ruminants is rarely used for cooking unless it is acutely required.

Therefore, Upper Mustang is an area where local indigenous institutions and cultural values are inseparable from the natural environment. The recent changes that have been observed have important implications for the biodiversity of the area and affect both the culture and the livelihood strategies of the local population. Upper Mustang is facing the loss of rare and endangered species that have been used medicinally for centuries by *amchi* (traditional Tibetan doctors). Concurrently, the demand of such species for medicine is growing, not declining. Likewise, some of the ecologically important rangeland and forage species (e.g. *Caragana*, *Astragalus*, *Juniperus*, etc.) are under heavy pressure both from animals and the human population.

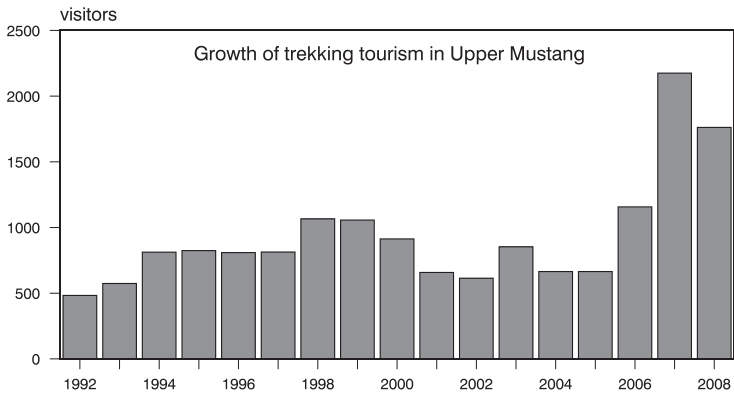
4 Tourism

Upper Mustang was a region forbidden to visitors for centuries. In March 1992, the government decided to open the region for controlled and regulated, high-paying tourism, setting a visitor limit of 1,000 tourists per year. The trekking fee to Upper Mustang was set at 500 USD per person for ten days, with an additional 50 USD per day for an additional four days. The idea was to plough back a proportion of the revenue earned from tourism into local economic development, as well as the preservation of the local nature and culture. Upper

Mustang remains among the last Tibetan Buddhist enclaves in the cold arid environment of the Trans-Himalayas, with its unique blend of history, living culture and religious traditions. There is an aura of mystery reinforced by a harsh environment, remoteness, relative inaccessibility, centuries of isolation and the difficult living and livelihood conditions. Ironically, the impediments of development constitute the very foundation for tourism development in Upper Mustang. Also, for the discerning westerner, the idea of a lost kingdom shrouded in the mysteries of a little comprehended past has its own appeal. This, together with the distinctive biodiversity of the region is a part of the tourist attraction of Upper Mustang.

4.1 Visitor Growth

From 1992 until 1999, there was a slow but steady growth in trekking tourism in Upper Mustang, to the extent that the quota of 1,000 people was passed in 1998 and 1999 (Figure 2). A look at the growth trend in tourism, in terms of total tourists flow to Nepal and those who came for trekking/mountaineering, and trekking in Upper Mustang alone shows that the allure of Upper Mustang has endured pretty well, relatively speaking.



Source: data annually recorded by the NTNC-ACAP, Unit Conservation Office, Lomanthang

Figure 2: Growth of trekking tourism in Upper Mustang

Trekking in Upper Mustang comprises a customized, full-service, self-contained trek normally organized by an overseas travel company in association with a Kathmandu based, and registered, trekking agency. Over two-thirds of the visitors to Upper Mustang visit in groups of more than six. In recent years

some 20–30 tea-house trekking tourists (who arrange their trek through a travel agency but stay in local lodges) are reported to have visited Upper Mustang, but the bulk of the tourists travel in a “package” tour. The package includes comprehensive camping gear along with guides, cooks and porters. Mules are often used for transport. Exclusive of the entry fee, such an arrangement reportedly costs USD 600–700 per person for a ten day trek.

4.2 Trekking Routes

The Upper Mustang trek basically consists of a trek to Lo Manthang which takes about four days through Kagbeni–Tangbe–Tsaike–Samar–Syangmochen–Jhaite/Ghiling–Ghami–Dhakmar–Lo Gekar/Tsarang–Lo Manthang. Normally, one or two days are spent in Lo Manthang. While in Lo Manthang, the trekkers visit the local monasteries and may visit places in Chosser and Chhonup VDCs. Staying overnight is not allowed beyond Lo Manthang, and only those with permits mentioning Nyamdo or Thinker are allowed to visit Chosser and Chhonup during the day. Most trekkers return to Kagbeni/Jomsom by the same route as they came.

4.3 Tourism Infrastructure

Private sector tourism infrastructure, in terms of hotels and lodges to cater to the trekkers, remains limited in Upper Mustang. There is, as yet, no comprehensive registration of lodges. In 2005, there were a total 37 lodges (32 with campsites) and six campsites in the 21 settlements in the seven VDCs of Upper Mustang. The lodges benefit from tourism by virtue of campsite fees and the lodging provided to porters and guides, but almost all of the lodges are patronized by Nepali travellers. Over the years the maintenance and facilities in the lodges have improved. However, only a handful of local households benefit from these lodges. Most are owned by members of the Mustang aristocracy.

4.4 General Impacts of Tourism

Because of the nature of tourism and the fact that almost all of the staff, as well as consumables, for the trekkers are brought from Kathmandu, there is very little economic impact of tourism in Upper Mustang. Studies of tourist expenditures in the region are not available. Rough estimates made by Bhattarai (2002), on the basis of information from key informants, shows that an average trekker spends 44 USD in the area during the eleven day trek, i.e., an expenditure of four USD per trekking day. Of the total expenditure 69% goes towards costs for the pony or mule and feed. Campsite costs accounted for

seven percent, entrance fee for monasteries (*gomba*) accounted for nine percent, handicrafts accounted for three percent, local food another three percent and the rest was spent on miscellaneous expenses.

Bhattarai (2002) also makes crude estimates regarding the sharing of total income accruing from tourism (including the Upper Mustang entry fee, ACAP entry fee, income to the trekking agency, and the host community) and concludes that of the total income 52% accrues to the central treasury, 38% to the trekking agencies, seven percent to ACAP and three percent to the Upper Mustang host community. Clearly, the gains to the local economy remain miniscule. For the *Loba* who have seen the impact of tourism in Lower Mustang and the ACAP region, the reasons for dissatisfaction with the nature and impact of tourism in Upper Mustang are therefore not difficult to find. Tourism needs to be made relevant for broadly shared local development that enhances local incomes and contributes to the production of infrastructure.

In economic terms, tourism in Upper Mustang has not impinged on local production, but has contributed to increased pressure for food items and fodder. Until now, the socio-cultural impact of tourism has remained limited, but greater awareness of the cultural and environmental heritage is clearly called for because signs of neglect of the vernacular architecture and the lack of maintenance and renovation of monasteries and *chorten* remain obvious. The linkage between tourism and traditional feudal institutions in Upper Mustang remains very strong. This has put the poor at a disadvantage because they are often excluded from the decision-making process. This is a very complex issue that needs to be addressed because poverty remains a key issue to be considered in addressing the concerns of conservation and development in Upper Mustang.

The impact of tourism *per se* on the environment is difficult to discern. Staff of trekkers clearly has an impact on the fuel demand. Alternative energy for cooking and heating remains a major issue. The efforts of ACAP over the years have paid off in the visible increase in plantations (mostly of *Populus ciliata*) all across the settlements of Upper Mustang, but plantations alone are not a substitute for alternative energy. Apart from this, the potential for hydro-electricity should be explored. The issue of alternative energy is further tied to the conservation of bio-diversity because bushy vegetation such as *Caragana* are uprooted and dried to serve as fuel for cooking.

The opening of the road to Koralla has facilitated the import of a variety of consumable Chinese products, often in bottles, tins or plastic wrappers. Although tourists are required to carry back their solid waste, with a monitoring system in place to ensure this, tourist destinations such as Lo Manthang openly evidence a spectacle of unmanaged solid waste, broken glass bottles and plastic wrappers,

contributed largely by the native population. The issue of waste management is an urgent one in many settlements.

5 Linking Ecotourism with Rangeland Management

The spatial distribution shows a good share in rangelands in Upper Mustang and there are still quite a number of local herders. The drying and changing climatic conditions and the increasing scarcity of grasses in pastures imposes greater threats to local herders' livelihoods. Thus tourism could possibly be a nice option to supplement their livestock herding. The nomadic lifestyle, the rangeland culture, the landscape and the pastures, as well as traditional herding sites, can be developed as a tourist products. Livestock products such as milk and meat can be used and manufactured into commercial food items such as cheese, butter, milk products, different meat items, *pashmina* wool, woollen clothes, etc. These products could provide a sum of money that could significantly increase the local herders' incomes.

5.1 Impact of Tourism on Rangeland Resources

The tourism business in Lower Mustang is becoming a part of the lives and livelihoods of the people. However, this is not the same in Upper Mustang, which is still a so-called restricted area. From a rangeland resources point-of-view this is rather beneficial, but as far as poor people are concerned the real benefits from this sector do not go to them. Currently, tourists in a group usually stay in big houses or hotels where camping facilities are available. Thus, the majority of the benefit goes to the people who run these places. Additionally, tourism has made buckwheat, wheat, naked barley, dry forage (hay), etc. expensive for the poor.

Despite all of this, there are some positive possible impacts on rangeland resources in the long run. Such impacts could include a change in the livestock herd composition because people maintain more productive animals for milk, meat, wool (*pashmina*) and egg production, due to an increased demand from tourists. This would reduce the number of unproductive animals. Also, livestock herders can go for product diversification in an intensive and commercial way; from low value, higher volume to high value, low volume. For example, they can produce milk for cheese, butter, *chhurpee* (dried cheese), and work on *pashmina* production and processing. Likewise, the climate of Mustang is best suitable for hay production, and there is a high demand for dried forage. This activity could take a commercial shape, even for those who do not have any livestock, as a bundle of hay weighing 1 to 2 kg can go for NRs 30.

5.2 Potentiality of Ecotourism Development in Rangeland Areas

The panoramic and unique landscape of the rangelands of Upper Mustang can be harnessed for tourism promotion. The Nepalese government's high priority for the creation of a road network around the Upper Mustang would also have a great impact upon the mode of tourism in Upper Mustang. Once the rural areas of Upper Mustang become regularly connected through the road, several pasture areas where local herders sustain their livelihoods can be developed as tourism destinations. Tourists can then make these side trips to experience new modes of life in the nature and culture of the area. Most of the rangeland can be harnessed for wildlife-based tourism for tourists to observe endangered species such as the snow leopard, the brown bear and frequents herds of blue sheep, along with being able to observe the fauna.

The following are the main potentialities for ecotourism promotion in the rangeland of upper Mustang:

- New destinations: expansion of the road network to new destinations, such as side trips for tourists to see the herder's community and the places of the nomads
- Promote tourism-based income generation for local herder's, in order to improve the livelihoods of herder communities
- Minimize the pressure upon the rangelands by linking tourism with conservation to reduce the conflicts between people and the wild life

6 Role of NTNC-ACAP in diversifying Tourism Benefits in Rangelands

In the last few years, the National Trust for Nature Conservation (NTNC), in cooperation with the Annapurna Conservation Area Project (ACAP), have been trying to diversify the distribution of money made from tourism to the remote local herders.

- (i) Pasture Land Management Sub-committee formation and support
 In the last five years, the project has formed a Pasture Land Management Sub-committee in order to support the local herders and improve the pasturelands they use. Regular meetings have been held and several useful decisions have been made to address important issues, such as the implementation of rotational grazing, increases in taxes and the resolution of some disputes about the sovereignty of pasturelands and their uses. This sub-committee is also useful for demanding infrastructure development programmes from concerned organizations.
- (ii) Training and awareness generation

The NTNC-ACAP with the collaborations of UNEP, GEF and ICIMOD, has undertaken several trainings, such as how to apply the participatory rural appraisal (PRA) methodology and on Appreciative Participatory Planning and Action (APPA). Additionally, it has conducted a needs assessment of pastureland management, conducted several planning workshops, implemented gender and advocacy training for female herders and conducted some income generation trainings, such as a *pashmina* extraction training. It has also supported exposure visits, herder exchange visits, etc. in order to enhance herders' capacities.

(iii) Livestock product sales

As the area of Upper Mustang is among the popular trekking destinations for international visitors, there is a great potentiality for sales of livestock products to tourists and their supporting staff. There is still a great demand for meat, such as yak, goat and sheep, from outsiders including tourists; hence NTNC-ACAP encourages the incorporation of local meat items into the local menus of hotels. Additionally, milk can be sold directly to the hotel and restaurant owners. The NTNC-ACAP is promoting local food items through intensive training for the herders and local enterprises involved in the hotel business. Apart from this, the project has organized some training sessions for the production of local handicrafts such as carpets and other woollen items, which can generate good incomes for the local herders.

(iv) Vegetable and kitchen garden promotion

In the last few years, the project has also focused on local vegetable farming for herders, and has supported this with the distribution of vegetable seeds and the provision of technical knowledge regarding vegetable and fruit farming wherever feasible. Recently, the project supported the construction of green houses in order to raise vegetable seedlings efficiently and more effectively so that the key farmers can distribute the vegetable seedlings to the local herders and other farmers.

(v) Side trips around the high pastures

Most visitors have a keen interest to visit the pastures as a side trip while they make a longer trip around Upper Mustang. Some of the pastures, such as Panga at Lomanthang and part of the Choser and Chhonup, are really impressive for viewing the landscape and watching the wildlife. The project is still focusing on the promotion of some active pastures as popular tourist destinations through slide shows at the information centre. The trend for tourists to take side trips around the pastures is increasing as the road network is extended around the villages of Upper

Mustang. This definitely provides the additional leisure time needed for the side trips, so tourists can find new experiences.

(vi) Incorporate herders into tourism

At the very beginning of tourism in Upper Mustang, most of the herders did not know about the importance of tourism and its potential impact on the local economy. Through several generations of awareness programmes geared towards the herders, they have begun to understand the importance of tourism and its linkage with resource conservation, along with wildlife protections. Currently, some of the local herders, and even a few nomads, have shown a keen interest to run small tea shops and restaurants while also tending to their livestock herds.

6.1 Concept and Strategy

The government, as well as concerned organizations, should focus on the promotion of tourism by diversifying the benefits to even the poorest of the poor groups, along with the local herders. The NTNC strategy and the ACAP Management plan, focus on the promotion of ecotourism through the optimum use of the available resources and with the greatest diffusion of the benefits, so that the poor people also feel the economic benefits of tourism. The NTNC-ACAP is still stressing promoting tourism through its annual planning and the implementation of ecotourism programme activities, such as providing trainings on tourism management, cooking and baking, renewable energy technology to serve tourists and additional trainings. It has also supported awareness programmes and exposure visits to enhance herders' capacities.

6.2 Challenges and Constraints

Remoteness, harsh climatic conditions and seasonal migrations are the major challenges being faced for sustainable livelihoods for the local people. Apart from this, the fragile nature of the area, limited resources and cultural vulnerability are some of the major challenge being faced for tourism promotion in the area. These problems can be minimized and overcome through the careful planning of tourism, with more focus given to ecotourism promotion and a focus on the resource conservation of the flora, fauna and culture.

7 Conclusion

Upper Mustang has good share of rangelands in relation to other spatial uses and still has a good number of local herders. Drying and changing climatic

conditions and increasing scarcity of grasses in pastures impose a great threat on the sustainability of local herders' livelihoods. Thus, tourism could supplement their livestock herding livelihoods. The nomadic lifestyle, rangeland culture, landscape and pastures, as well as traditional herding sites, can be developed as a tourism destinations. Additionally, livestock products, such as milk and meat, can be used and diversified into saleable food items such as cheese, butter, milk products, different varieties of meat items, *pashmina* wool, woollen clothes, etc. which could fetch good sums of money and significantly impact the incomes of local herders.

Livestock herders can aim for product diversification in an intensive and commercial way; from low value, higher volume to high value, low volume, products. For example, they can produce milk for cheese, butter, *chhurpee* (dried cheese), and also produce *pashmina* wool.

The panoramic and unique landscape of the rangelands of Upper Mustang can be harnessed for tourism promotion.

The Nepalese government should maintain its high priority for the expansion of the road network around Upper Mustang, as it could have a great impact on the mode of tourism in the area. Once the rural areas of Upper Mustang have become connected through the road, several pastures areas where local herders support themselves can be developed as tourism destinations, or side trips where tourist can experience new modes of life and experience the different nature and culture of the area. Most of the rangeland side trips can be used for wildlife-based tourism, where tourists can observe endangered species such as the snow leopard, the brown bear and the blue sheep.

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3.3 Balancing Protection and Development to Achieve Sustainable Tourism Growth in Pastoral Communities. A Case Study on Namtso Scenic Area

Guge Qimeiduoiji, Tenzin Zhuoga, Tudeng Kechu¹³

Abstract

The development of rural tourism is not only conducive to promoting the rural economy in the Tibet Autonomous Region (TAR), but also an important means of utilizing scattered rural surplus labour. It is an effective way to build a brand of harmonious tourism, increase pastoralist incomes through tourism revenues and promote ecotourism. Based on the experiences of rural tourism in Tibet, this article uses a case study on the Namtso Scenic Area to discuss the development and protection of local tourism resources and practices and the encouragement of local herdsmen to participate, to protect the environment and increase tourism revenues. The authors also analyze problems of the status quo, and propose countermeasures for furthering the development of tourism in the Namtso Scenic Area.

1 Overview of the Namtso Scenic Area

The Namtso Scenic Area (NSA) is located in Damxung County of Lhasa City, and Bangor and Nagqu County of Nagqu Prefecture, Tibet. Its geographical coordinates cover longitudes 89°30'–91°25' and latitudes 30°00'–31°10'. The total area of the NSA is about 9,684 km², and it spans 114 km from east to west, and 150 km from north to south (China Academy of Urban Planning and Design 2008). Its jurisdiction includes seven towns of Damxung County, four towns of Bangor County and one town of Nagqu County. The NSA has up to 3,000 hours of sunshine every year, with an annual sunshine rate of more than 65%. The average temperature of the hottest month is 10.8 °C and –9.9 °C for the coldest month. It has distinct wet and dry seasons, with the rainy season lasting from June to October and the dry season from November to May.

One of the core attractions of the NSA is Lake Namtso, the world's highest saltwater lake. It originated from a major rift on the northwest slope of the

13 All authors are affiliated with Tibet University, Lhasa

Nyainqentanglha Mountains. As an inland lake, it has an elevation of 4,718 m and a circumference of about 318 km. The lakeside area has a relatively flat topography, with a rich variety of vegetation. The main types of vegetation include the *Stipa purpurea* steppe, Kobresia meadow of Northern Tibet, sedge of Qinghai–Tibet, alpine shrubs, alpine sparse vegetation, and alpine Kobresia meadow. Bears, wild yaks, blue sheep and other wildlife live around the lake, and plateau fish such as *Qinling lenok* and *Gymnocypris przewalskii*, fish without scales, live in the lake.

To the south and east of Namtso rises the Gangdise-Nyainqentanglha Mountains. To the northwest of the lake lies a broad plain, where you can find more than one gravel-dominated terrace. Among them stand many isolated residual hills. At the south coast, there is the Tashi Multi Peninsula. At the northern tip of the peninsula stand two groups of limestone hills. The one in the southeast is called Duoqing, with an elevation of 4,920 m. The western hills are called Duoqiong, with an altitude of 4,852 m. At the northeast coast, there is a flower-shaped peninsula, composed of three smaller islands visited mainly by birds.

Another core attraction of the NSA is the Nyainqentanglha Mountains, spanning across the entire scenic area from east to west. The altitude of the peak of the Nyainqentanglha Mountains is 7117 m. The majestic and spectacular mountain is described as one of the most splendid mountains of the Tibetan Plateau. It is one of the most famous and sacred mountains in Tibet and is considered to be one of the nine indigenous mountain gods in Tibetan mythology. It is also one of the nine gods who created the world, which are widely worshiped by the pastoralists in northern Tibet. It is revered as the patron saint in charge of wealth and controlling hailstorms. The people who live in the 360 snow-capped mountains around the main peak are symbolically regarded as its subjects.

1.1 Advantage of the Namtso Scenic Area

1.1.1 Tourism resources

The Namtso Scenic Area has a vast and magnificent highland lake, majestic snow-capped mountains, and towering glaciers and rare and unique plateau geothermal resources, forming a complete ecosystem. It has both high scientific value and in addition there is the value of the landscape beauty. The rich cultural heritage and natural landscape blend to form colourful scenery. It has become one of the most rapidly developing tourist attractions of the Tibet Autonomous Region. On December 28, 2009, it was officially included in the seventh batch

of the National Scenic Area List and the National Natural Heritage List. It is also one of the regional-level nature reserves.

The NSA is a world-class ecotourism spot, with typical natural ecology, fine air and pure water. In addition to its aesthetic values, the NSA is home to unique architectural styles, an orderly society and original folk customs, attracting many tourists from home and abroad. It is one of the tourist attractions that helps place Tibet as one of the top tourist destinations of the world.

In the area as a whole there are more than ten temples, with four around Lake Namtso, namely the Old King Temple, Doga Temple, Caddo Temple and Tashi Duo Temple. There are four doors of rock paintings in grottos, which tell mysterious folk legends. Buddhist pilgrims come to Lake Namtso to offer their devout worship, especially during the Year of the Sheep in the Tibetan Calendar. Tens of thousands of religious people take ritual walks around the holy lake, and the scene is truly spectacular.

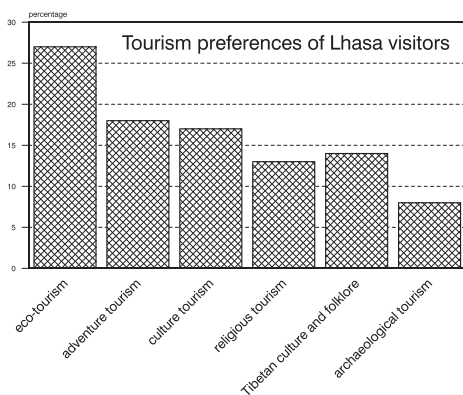
In addition, herders living in the scenic area still maintain traditional economic patterns, social conventions and lifestyles. The unique natural environment has given birth to unsophisticated nomadic folk customs, such as the high-pitched madrigal and the bold horseracing, shaping the brave pastoralist character. In recent years, with the campaign of building the countryside, pastoral communities have begun to build permanent housing. However, due to their traditional nomadic lifestyle, they still live in tents during the grazing seasons of summer and fall. At this time of the year, tourists coming here usually fall into a picture of touching beauty, with wild flowers blooming everywhere around Lake Namtso, cattle and sheep flocks scattering, tents dotting, smoke curling, pastoral melodies echoing, flutes bursting, and the snow-capped mountains and glaciers lying in the distance, constituting a serenely intoxicating harmony of man and nature.

1.1.2 Geolocational advantages

The Qinghai-Tibet Highway and Qinghai-Tibet Railway run through the Namtso Scenic Area, providing very convenient transportation. The centre of Namtso is 260 km away from Lhasa City, about 60 km from Damxung County, and 300 km from the Gonggar Airport. According to statistics from the tourism department, between 2006 and 2009 Tibet's tourism industry maintained high growth, with about one fifth of domestic and foreign tourists visiting Namtso. The percentage has been increasing annually (See Figure 1).

Behaviour analysis of tourists in Lhasa shows that visitors are increasingly demanding better protection of local resources and wish to have more knowledge-

based tourism products (including ecotourism). The highest preference is for ecotourism, followed by adventure tourism and cultural tourism. From the analysis, pristine natural environments will continue to be welcomed by tourists from both the domestic and international market into the future. The Namtso Scenic Area, with its beautiful natural environment and its mysterious and unique Tibetan culture has met all of the requirements for building a world-class tourist destination. Its unique advantages in resources, the increasing number of foreign tourists and the rising demand for its tourism products have created favourable conditions for the development of different tourist products and have increased the attractiveness of the NSA as a tourist destination.



Source:
Controlled Execution Plan
for Development of
Namtso Scenic Area,
Lhasa (2006–2020)
Figure 1:
Tourism preferences of
Lhasa visitors

1.2 Status quo of tourism development in the NSA

Lake Namtso, as a famous religious pilgrimage, has a long history of religious activities. In 1980, when Tibet opened its doors to the outside world, Namtso was among the first sites to attract foreign tourists. In 2002, it was designated as a regional nature reserve, and planning was started to build an entire scenic area in 2008. On December 28, 2009, the NSA was officially included in the seventh batch of the National Scenic Areas. The Namtso scenery has plateau lakes, mountain glaciers and geothermal hot springs. It has a typical plateau landscape with mountains and lakes. Its unique climate and complex and diverse geological conditions make it even more mysterious.

At the same time, the scenic area has been the site of activities for Tibetans since ancient times. History, culture and religious beliefs have combined to create a unique religious and cultural heritage, adding cultural connotations to its most breathtaking natural beauty. The scenic area has 51 natural spots and twelve cultural spots. It has two “hearts” (Lake Namtso and Nyainqentanglha Peak), and

“nine arms” (the Tashi Duo Peninsula, Tuoren Loebri Peninsula, Doga Temple, Old King Temple, Niamey Wetlands, Ari Wetlands, Nagenla Mountain Pass, Sang Dan Kong Sang and Yangbajain) (China Academy of Urban Planning and Design 2008). In the scenic area, only resources on the Tashi Duo Peninsula are being developed, that comprise less than a quarter of the scenic area.

Tourists visiting this spot have been increasing every year (with the exception of 2008), as shown in Figure 2. It has attracted 200,000 domestic and foreign tourist visits annually. In the first four months of 2010, there were already 10,906 domestic and international visits recorded. Revenues from tourism related industries reached 2.2 million Yuan. According to the “Master Plan for Tourism Development in Lhasa (2010–2020)”, passed in June 2010, the Lhasa Municipal Government will prioritize the development of projects such as the Tashi Island and Sacred Lake Cultural Experience and the International Hikers Headquarters. Efforts will be made to establish Namtso as a world famous natural and cultural heritage site, an ecotourism demonstration project, a National 5-A Scenic Area and a top international holiday resort for domestic and foreign tourists. While giving importance to the concept of environmental protection, we will effectively expand the recreational value of the Namtso Scenic Area.

1.3 Good ecological environment

Namtso has untouched nature, and unique hydrology, lake altitude, biological communities and other rare features. It has been established as a nature reserve by the TAR government during the tenth- five-year-plan period due to the vulnerability of its ecological balance, the diversity of its species, the representation of the Tibetan Plateau and the coexistence of natural and cultural heritages. The status means that it gets substantial support for development and conservation from the government of TAR. It has been identified in the “Tibet Autonomous Region Ecological Environment Construction Plan” and the “Tibet Autonomous Region Development Plan for Nature Reserve”. At the same time, the relevant departments, in line with the principle of “integrating the process of development and protection”, have compiled the 2000 edition of the “Master Plan for Developing Eco-Tourism in Namtso Scenic Area, Tibet” and the 2006 edition of the “Controlled Execution Plan for Development of Namtso Scenic Area, Lhasa”. We have considered the relationship between environment protection and development and embraced the concept of sustainable development. The Environmental Protection Agency of TAR has set up an environmental monitoring station to check the quality of air, water and soil of Namtso regularly. In the 1990s, various road construction projects around the Namtso Lake made

it “accessible” to vehicles, but the wheels caused serious damage to the grass and other vegetation around the lake. After the construction of an asphalt road in 2001, we began to set up fences on both sides of the new road to protect the rangelands so that motor vehicles can no longer enter. This has effectively curbed further environmental degradation. Nowadays, on Tashi Island where most visitors go, the government has built six toilets, and hired thirteen garbage cleaning staff workers. Here we have divided the entire scenic area into different “plots of responsibility”, with specific tasks of cleaning up and pollution control. According to recent statistics, garbage collected each day weighs about five tons and is transported to the landfill 20km away. This year, we are building a new landfill with a total capacity of 140,900 m² in a location that is five kilometers away from Damxung County. Currently in the entire scenic area, there are no permanent buildings, only temporary housing.

2 Status of Rangelands in Namtso Scenic Area

To take Namtso Town as an example, it is under the jurisdiction of Damxung County. The eastern Namtso lakeside area is under development and administered by Namtso Town. It was first established as a township in 1960, became a people’s commune in 1970, reestablished in 1984, and merged with Natso, Sede, and Qiage in 1988 to be the new Namtso Town. The local economic development relies mainly on animal husbandry, namely goats, sheep, yaks, pian niu (the cattle-yak hybrids) and horses. Other niche products include fungus, Fritillaria and other valuable herbs. The total land area is 27.15ha, including 16.90 ha of rangelands and accounting for 62.2% of the total area of Damxung County. It has the largest rangelands in Damxung, accounting for 24.4% of the total rangelands. The number of households in 2009 was 887, with a population of 4553. They are all Tibetans. In 2009, the livestock of the town numbered at 100,494, including 31,118 yaks, 58,366 sheep, 10,098 goats and 912 horses. The GDP was 12,578,100 Yuan, with the output value of primary industry at 9.7302 million Yuan, accounting for 77.35% of the total; the secondary industry 98,400 Yuan, or 0.78% of the GDP, and the tertiary industry 2.7495 million Yuan, or 21.86%. Per capita income was 3,000.84 Yuan, with big income disparity among pastoralists. According to the 2009 statistics, 21.64% of the population had a per capita annual income of less than 1,000 Yuan, 40.21% between 1,000 Yuan and 2,500 Yuan and 39.18% above 2,500 Yuan. A few households had a family income of nearly 100,000 Yuan.

Table 1: Rangeland utilization status in Dangxiang County, 2000
(in thousand hectares)

	Total land area	Rangeland					Cultivated pasture
		Winter rangeland	Summer rangeland	Non-seasonal rangeland	Temporary rangeland	Seriously degraded rangeland	
Namu Lake Town	271.5	79.0	73.9	5.9	6.0	6.6	-
Ningzhong Town	173.2	4.8	72.1	3.4	-	-	0.3
Dan-guoka Town	34.6	13.0	10.8	-	-	-	0.3
Gongtang Town	66.4	23.7	27.4	-	-	-	-
Longren Town	23.8	7.0	13.7	-	-	-	-
Wu-matang Town	13.8	46.2	58.8	-	-	-	-
Yangba-jian Town	114.3	28.8	31.9	1.3	-	-	0.1
Geda town	183.8	59.9	64.2	10.9	-	-	0.07
Total	881.5	262.5	60.0	18.0	6.0	6.6	0.8

Source: Office of Documentation, Damxung Chronicles

Table 2: Labour structure of Namtso Town, 2009

Town name	Total labour force	Categories						Migrant work
		pastoralism	Pastoralism-related industry	Transportation/Construction etc.	Odd jobs	Hospitality and catering	Migrant work	Within the area of origin
Sede	408	408	125	24	4	2	171	110
Qiaga	729	729	327	18	32	3	238	172
Namtso	723	717	217	24	27	9	231	210
Dabney	536	536	240	6	3	10	220	201

Source: Department of Statistics, Damxung County

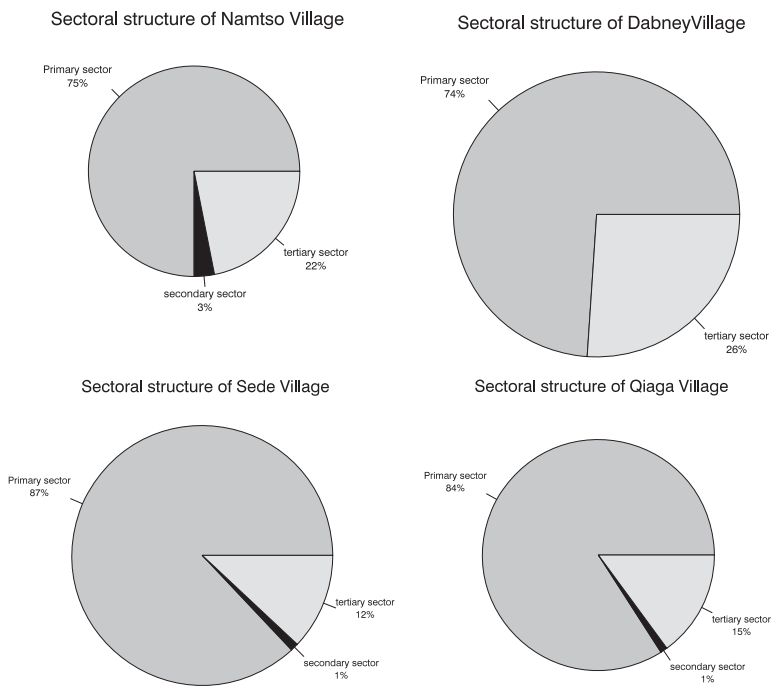
3 Impact of Tourism on the Economy of the Namtso pastoral Communities

3.1 We have promoted the pastoral economy and optimized the industrial structure

Tibet's traditional pastoral economy relied basically on a simple, closed and subsistence-oriented livestock production model, although commodity economy sometimes existed in the form of "barter" in the agricultural animal husbandry sector. However, the overall development of the market economy, its exchange relations and other market-based mechanisms was heavily impeded by traditional thinking. In the mind of pastoralists, exchange of livestock was something that was forced upon them due to lack of self-sufficiency, let alone to develop the exchange-based commodity economy. In the eighties of last century, the Sichuan People's Publishing House published a book co-authored by Wang Xiaoqiang and Bai Nanfeng, entitled "Poverty in Abundance". One of the book's tenets is "The direct cause of poverty is poverty in idea".

Before the development of Namtso Scenic Area, pastoralists in the surrounding area were almost bystanders with extraordinary tourism resources who looked up as domestic and foreign tourists came and went away. After the development of Namtso Scenic Area, we saw the rapid growth of tourist traffic, the diversification of tourist products, and the active participation of developers. Consequently,

pastoralists in the surrounding area became more enthusiastic about promoting tourism. Especially in recent years, due to the explosive growth in the tourism industry in Tibet, “travel in Lhasa” gained more and more brand power, and became the leader of tourism in Tibet. In 2006, the Lhasa municipal Tourism Bureau and the People’s Government of Damxung County approved the scenic landscape development plan by Beijing Dadi Planning Institute. It is called the Controlled Execution Plan for Development of Namtso Scenic Area, Lhasa. The Plan on one hand reflects the unique advantages of tourist resources in Namtso, and on the other hand, encourages pastoralists to get involved in development of tourism and increase their income through provision of tourism services and products. For example, there are currently thirteen yogurt-processing mills in Damxung alone. The annual output value of yak yogurt alone reaches 100,000 Yuan. Local pastoralists reap 30,000 to 50,000 Yuan each year from selling milk. These activities have not only made pastoralists more enthusiastic and active players in the tourism market, but also boosted the pastoral economy in the surrounding area of Namtso, optimizing the local economic structure. Figure 3 shows that the tertiary industry in Dabney and Tashi Village is soaring due to its proximity with Tashi Duo Island recently. On the other hand, a higher proportion of the traditional industry exists in Sede Town since it is farthest away from Tashi Duo Island. The closer the pastoral community is to Tashi Duo Island, the more of the population get involved in tourism.

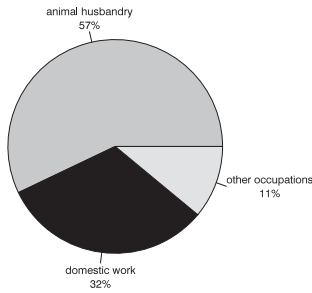


Source: Department of Statistics Damxung County 2010

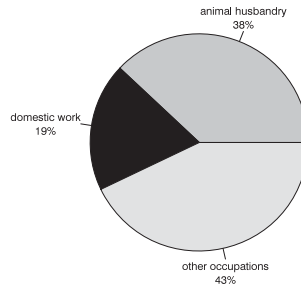
Figure 3: Comparison of the sectoral structures of the four villages of Namtso

After the development of Tashi Duo Island, the industrial structure of Namu Village and the surrounding areas have been changing significantly, with important transformations in the labour distribution. In 2002, the township had a total labour force of 2,011, including 1,131 persons engaged in traditional animal husbandry. In 2009, the total labour force reached 2,396, including 909 persons engaged in traditional animal husbandry, 220 fewer than in 2002. The remaining labour was employed in providing accommodations, catering, transportation, wholesale and retail trade and so on, with the ratio increasing by 32% in 2009 (Figure 4). Herders have been increasingly participating in tourism year by year. With the third industry growing rapidly, pastoralists gain additional income sources and have a more diversified income structure. Moreover, pressure on the rangelands has been alleviated as well.

Rural labour structure in Namtso 2002



Rural labour structure in Namtso 2009



Source: Bureau of Statistics Damxung County 2010
 Figure 4: Rural labour structure in Namtso, 2002-2009

3.2 The expansion of the market has promoted employment of pastoralists

Tourism is a labour-intensive industry. According to studies of the Organization for Economic Cooperation and Development (OECD), each dollar made in tourism sees an output-worth of 4.3 dollars in related industries. For each person employed in the tourism sector, five or six jobs will be added to the rest of the society (Gao 2008). To practitioners, tourism has a relatively low skill requirement for employees, and therefore has a unique advantage of providing employment to pastoralists. It has been proven that significant employment opportunities can be created by satisfying the needs of tourists in terms of food, shelter, transportation, travel, shopping and entertainment, as well as a variety of other products and services.

The development of the Namtso Scenic Area has stimulated an upgrading of the industrial structure in Namu Village and the surrounding area, prompting the rise of the second and tertiary industries, and absorbing the surplus labour force in most pastoral areas. Catering, transportation and other service industries have sprung up to engage surplus labour in the pastoral areas, thus creating more employment opportunities. The leading industry in Namtso Village is animal husbandry. Since the village is located in the Namtso Scenic Area, tourism has brought many benefits to the local pastoralists. In 2009, we found more than 200 restaurants and lodges and 43 souvenir stalls on Tashi Duo Island. Only two of the stalls were run by pastoralists from Dabney Village, and the rest were run by outsiders. There were 20 people selling prayer

flags; all from Nyemo County. In total 225 horses and 93 yaks were provided for tourist photos. On a daily basis about 31 yaks and 75 horses were on shift, with a rotation every ten days. The resorts in the Scenic Area employed more than 400 people (Table 3).

Table 3: Pastoralists' participation in tourism in Damxung County

Category	2006	2007	2008	2009
Total pastoralist income from tourism (in million Yuan)	21.5	25.9	6.7	34.1
Per capita pastoralist income from tourism (in thousand Yuan)	16.9	17.8	5.3	18.2
Total number of pastoralists engaged in tourism	1403	1454	1255	1875
Households running lodges	20	27	24	32
Households providing transportation	18	24	11	29
Number of resorts	2	3	3	4
Entrepreneurs renting-out yaks and horses	218	284	110	318
Persons selling prayer flags	13	14	10	20
Persons selling arts and crafts	21	48	22	50

Source: Tourism Bureau of Damxung County 2009

3.3 Market development has contributed to improving the income of herdsmen

As we all know, the variation in income structure of herders in pastoral areas is a direct result of changes in other sectors. The duality of the family income structure in Namtso, to some extent, has affected the consumption and accumulation structures of local pastoralists, changing the level of income for herdsmen in the surrounding areas as well.

According to an investigation and analysis of changes of the economic structure and per capita income of herdsmen in the NSA before and after tourism development, we can see that the main source of local herdsmen's income on Tashi Duo Island before development was revenues from traditional family-run businesses and wage-income migrant labour. Even today, some households still get their main income from these traditional family-run businesses. Due to the traditional model of animal husbandry, pastoralists have only a single source

of family income, and are susceptible to the great influence of the natural elements. They pastoralists also often have very little education in modern science and economics. Hence, their capacity to participate in the market is relatively poor, resulting in a simplistic and traditional value chain in the pastoral communities.

The manageable capacity of Tashi Duo Island is to receive more than 1,000 people at a time. The per capita net income of 2010 was 5,488 Yuan (China Academy of Urban Planning and Design 2008). Seventy percent of the tourism revenues come from Dabney Village and 30% from Namtso Village. A pastoralist can make 20–180 Yuan per day by being a horse or yak guide. The output value of the catering and accommodation sector reaches one million Yuan. In the town of Namu, for example, the per capita net income figures were 1,620 Yuan, 2,610 Yuan, and 3,001 Yuan respectively for 2001, 2004, and 2009 with an average annual growth rate of 172.56 Yuan.

4 Problems in Tourism Development of the NSA

The development of tourism resources has brought great economic and social benefits to pastoralists, contributing to the rapid growth of pastoral incomes. However, some development and management problems are also increasingly prominent. Through field visits, we found problems in the four main areas outlined below.

4.1 Administrative restrictions and barriers are causing development disparities in different scenic spots

Due to transportation constraints, most of the current tourist traffic to the NSA ends up on Tashi Duo Island, Damxung. However, with an improvement of traffic conditions in Bangor County, visitors in the future will have direct access to Nagqu Territory via the State Expressway 109.

The value of various tourism resources will change as will the tourism development patterns in the NSA. Tourist attractions of Bangor County are currently in the planning stages. The famous Dolma Canyon of the Sangdan Gangsan Mountains in Gulu Town of Nagqu County has already started initial development as have other attractions near State Expressway 109. This could lead to duplication in planning, redundant construction and conflicts between resources and tourists. Management barriers might be numerous and the market mechanisms might run into trouble.

The rights and responsibilities of tourism development and ecological protection are not yet clearly defined. The current situation is not conducive to improving the ecological protection of the scenic spots and may lead to serious pollution. The division of the management and development rights and responsibilities is unclear between the Tourism Bureau, Land Planning Authority and the Environmental Protection Agency of different counties. Controversies about tourism revenue distribution have risen among different villages. Although the pastoralists located in the scenic spots obtain a substantial increase in income through leasing their land and houses and running tourism-based businesses, the herdsmen who live outside or far away from the scenic spots fail to obtain such benefits due to travel restrictions and limited exposure. This has led to a conflict of interests and constant disputes between pastoralists living within and outside of the scenic areas.

4.2 Poor infrastructure restricts the effectiveness of resource allocation in the Namtso Scenic Area

Since the development of the NSA, we have not been able to meet the growing tourism needs, although infrastructure in the scenic area is constantly improving. During the peak seasons and holidays, the existing roads, parking lots, accommodation and water facilities are highly stressed. Tourists have a hard time finding and getting the services they need and operators cannot maximize their income due to insufficient capacity. In particular, power supply is a big problem. Hotels usually rely on a small generators or solar power, as regular power is generally cut off at about eleven o'clock at night. The lack of basic infrastructure, and the poor quality of what is there, has led to poor standards and quality of services, resulting in the loss of tourists. Consequently, pastoralists find it more difficult to increase their incomes, affecting sustainable economic development in pastoral areas.

4.3 Limited mindset of pastoralists is restricting an enthusiasm to participate in the tourism market

Herders of Tashi Duo Island generally have a low level of education and training, limiting the quality of their services. Through field visits to pastoralists and the relevant administrative departments, we found that only a few pastoralists of Dabney Village went to school at all, with the rest of the population being illiterate. We interviewed three local “experts of getting rich”, and none of them had any formal schooling. They learned a few Tibetan letters at an evening course and picked up some simple Chinese phrases in the course of doing business with tourists. As a result of their limited linguistic capabilities, they can only

get their supplies from a fixed wholesale point in Lhasa. Currently most of the local herders of Tashi Duo Island have had little education. Consequently, their innovative abilities and adaptability are often poor, with little market awareness and a strong risk consciousness. They are simply engaged in traditional manual work. It is difficult for them to open up new revenue channels. Therefore, it is very important for local authorities to provide them with training. We should instil the advanced concepts of development into the minds of local herders, train local residents as tour guides and help develop new tourism products such as hiking around the lake, lakeshore visits and other ecotourism products.

4.4 With the steady increase of tourist traffic, the ecological environment of the scenic area is facing a severe test

A healthy ecological environment is the foundation for sustainable development of tourism in Namtso. Its condition determines the sustainability of tourism development in pastoral communities. As more and more tourists come to the scenic spots of Namtso, the ecological environment of the area will face varying negative impacts. Although there has been no large-scale ecological destruction, there have been a number of ecological and environmental pollution incidents. For instance, the *hada* – a long piece of silk used for greetings and other ceremonies (in Tibetan: ཁ་བཏགས་ *kha btags*) – and prayer flags (དར་ལྗོངས་ *dar loog*) left behind on the tops of the mountains by tourists and the garbage left by nomadic pastoralists can cause problems. In the case of *hada* and prayer flags, they are usually plastic products. Tourists and religious pilgrims are keen on throwing *hada* and hanging prayer flags in high places, some for the promotion of good will and compassion and some are just for fun. According to preliminary investigations, a *hada* shop on Tashi Duo Island has sales revenues of more than 400 Yuan per day in the peak season, selling more than 1,000 *hada* each day. The tourists sometimes leave the *hada* in crevices, at mountain peaks or by the lake, creating one of the major sources of “white garbage” in the scenic area (as shown in Photo 1). In particular, during the Tibetan Year of the Horse, the pressure on the environment shot up, with tens of thousands of religious people buying *hada* and prayer flags (Photo 2). In addition, the exhaust emissions from tourist vehicles, the garbage and emissions from tourist restaurants and hotels, abandoned beverage bottles, food bags and other waste have a certain impact on the various scenic spots.



Photo 1: Hadas thrown at the “Palace of the God of Medicine” on Tashi Duo Island (photograph © Guge Qimeiduoiji)

5 Counter-measures for achieving sustainable and healthy Development of rural Tourism

5.1 We shall institute a holistic concept for tourism development and establish and improve the Greater Namtso Scenic Area

In our master plan, the three counties of the Namtso Scenic Area – Damxung, Bangor County and Nagqu – shall be grouped together to form a greater scenic area. With the establishment of the Greater Namtso Scenic Area, administrative constraints shall be reduced. On the basis of close co-ordination of the interests and responsibilities of relevant parties, an independent establishment similar to the Zhangmu border market will be set up under the direct administration of the Tibetan Autonomous Region (TAR) Tourism Department. We shall maximize the tourist functions and utilize economies of scale to form a more economic tourism structure, develop a circular economy and effectively promote the balanced development of various scenic spots of the Greater Namtso Scenic Area.



Photo 2: Prayer flags hanging randomly on the hill slopes of Tashi Duo Island
(photograph © Guge Qimeiduoji)

Our suggestion to build the Greater Namtso Scenic Area will not only expand the geographical space of the Namtso Scenic Area, but also combine the resources of snow-capped mountains, rangelands, blue sky and such. We shall be able to end the current situation of having only one lake as our biggest tourist attraction. We shall form a variety of joint compound attractions, building a large scenic area and a stronger brand. To this end, there must be a government-led implementation with scientific and standardized management.

First, we should properly resolve the issue of resource ownership in tourism development. The local government and relevant departments should jointly set up an authoritative development regulation agency. Under the auspices of the government, experts should conduct a comprehensive survey of the area to develop a master plan for developing the Greater Namtso Scenic Area and creating a controlled execution plan. With a unified plan we shall be able to regulate the development of tourism resources in each scenic spot to promote common development, strengthening integration and the mutual complementary nature of tourism resources.

Second, the government should coordinate the interests of pastoralists and developers, resolve the conflicts amongst pastoralists, and establish proper relations with the relevant departments, such as the Board of Trustees of the

Namtso Scenic Area, the Environmental Protection Agency, the Land and Resources Management Bureau and the tourism sector.

Third, the government should encourage and explore various forms of financing and capital investment. Using a project as an example, the enterprise may invest in financial capital. The village collective may trade land use rights in return for part ownership of the project, and the villagers may turn human labour into shares of capital. The purpose is to realize the comprehensive and coordinated development of the enterprise, the collective and the individual pastoralists.

5.2 We shall strengthen our infrastructure and improve our service capacity

“Infrastructure provides important physical conditions for economic growth and social development. Infrastructure building plays a huge role in reducing farming costs and enhancing the market-oriented rural economy. It also promotes the increase of income for pastoralists” (Fang 2007). Therefore, we should increase our infrastructure construction and improve our service and reception capabilities. Under the guidance of government planning, we shall increase our infrastructure building efforts and improve rural roads, communications, utilities and other facilities. We shall prioritize the development of infrastructure in tourist villages.

Pastoralists generally believe that a tourism-based business is very difficult to start from scratch. Therefore we should utilize multiple channels to help herds-men obtain seed capital. We should strengthen capacity building so that the herders can increase their awareness about the market economy and develop relevant skills and management expertise. There should be a variety of channels for pastoralists to acquire tourism business knowledge and skills so that the overall quality of tourism services may improve.

In the process of developing tourism in Namtso, the main stakeholders are pastoralists. Their qualifications are directly related to the quality of tourism services and the pace of development. For the sake of sustainable development of rural tourism and increasing the incomes of pastoralists, we should enhance the training of practitioners in tourism, especially the pastoralists. Better education and training will ensure better professional services in the local tourism sector. It should be said that the training of pastoralists would provide opportunities for them to learn a new approach to development, how to protect eco-resources and enhance their capacity for self-improvement. At the same time, the sustainable development of rural tourism will provide more impetus

for the introduction and spread of modern science and technology, business concepts and management tools among farmers and pastoralists. With better and more innovative services, the internal driving force of tourism will accelerate the integration of pastoralists into modern society. In this way, our society will achieve win-win development for both herders and the rural economy.

5.3 We shall ensure the balanced development of tourism and ecological environment and increase the protection of rangeland resources

A good ecological environment is an important factor for attracting a large number of tourists and for achieving sustainable development of rural tourism. In the development of ecotourism in the Namtso Scenic Area, there is a risk that natural ecology becomes more vulnerable as a result of economic development. The slightest mistake in utilizing resources may easily lead to serious ecological damage from which it would be difficult to recover. In resource development for tourism, we must always adhere to the principle of “protection first, development second”, striking a balance between tourism development and environmental protection.

Throughout the development process, planning, construction, management and monitoring there are four instances where accountability has to be measured. We must seek out the market gaps and optimize the system of accountability. First, we shall adopt scientific means to protect and monitor the ecological environment in Namtso, impose reasonable control on environmental capacity and strengthen tourist education. While respecting nature, we shall try our best to provide tourists with memorable experiences at reasonable prices.

In the process of orderly development, tourism should play a bigger role in the promotion and protection of the local ecological environment (Gao et al. 2006). We shall carry out scientific planning on the basis of the calculated environmental capacity, the daily needs of local residents and the local livestock production capacity. We shall control the number of visitors to within the carrying capacity of the natural environment to avoid irreversible damages of natural resources.

We should consider all kinds of tourist needs during the planning phase, and develop an aesthetic design with a focus on harmony and synergy. This way we will have both diversity and harmony in our rangeland-based tourist attractions (Gao et al. 2006). We can also create an exhibition park of rangeland ecosystems and establish a popular science education base for information on the biodiversity of the rangeland ecosystem. We shall strengthen green oases and landscaping and improve hygiene and sanitation in the surrounding area.

We shall increase restoration and management of the already damaged environment, and strive to create clean and beautiful villages. The modern ambience will promote the healthy and sustainable development of the Namtso Scenic Area, contributing to a balanced development between urban and rural areas.

5.4 We shall guide and encourage the pastoralists to participate in tourism and reduce the pressure of livestock on the rangelands

We conducted in-depth interviews with two pastoralists in the town of Namtso in order to understand the history and size of their tour operations, as well as their modes of operation, revenues and the kind of services they provided for tourists. We were trying to understand the preferences of herdsman between the tourism industry and the practice of animal husbandry, and their views regarding rangeland degradation.

They gave their livestock to be cared for by their parents or brothers while they were busy catering to tourists. They said that every year they earned more cash income by participating in tourism than they had from selling livestock. However, they believed that tourism had not developed enough to replace animal husbandry. While supporting tourism development, they felt that the government needed to adopt appropriate administrative measures to restrain the further development of animal husbandry.

From our survey, we found that the government quota for each person in Dabney Village is 22 sheep units per person. At present, 30% of the herdsmen exceed the quota, while 20% of the herdsmen are under the quota. Those herdsmen who exceed their quota rent the rangelands of those who are under the quota with meagre compensation. In the end, the total amount of livestock exceeds the quota. The town of Namtso has the biggest area of severely degraded and low quality rangelands in Damxung County, totalling 6,556 ha. The total number of livestock from this town ranks second in the eight towns of Damxung. In 2009, the number of livestock in the town of Namtso was 100,494. With an average of 22.1 sheep units per person, it was still over the quota.

Therefore, we shall step up efforts to guide herders to be involved in tourism with the establishment of more incentive mechanisms. We shall give more compensation to herdsmen who actively participate in tourism, as was done in the Emei Mountain Scenic Area of Sichuan Province. Farmers in Emei Mountain Scenic Area are encouraged to participate in the reforestation campaign and strictly forbidden from cutting down trees. The local government gives free food to local people and incentivizes their participation in tourism to increase cash incomes. By adopting similar measure here in Namtso, we may be able

to control the overload of livestock and achieve better protection of rangeland resources, moving in the right direction to support the ecological protection of the scenic area

5.5 We shall establish rules and regulations for scenic spots and promote the harmonious and orderly development of ecotourism

In order to ensure quality tourism services and promote eco-environmental protection, we shall formulate relevant regulations and put out warning signs. Currently no warning signage exists in the scenic area, or relevant regulations. There should be clear rules and regulations on food packaging, transport and per capita consumption of resources to facilitate law enforcement. There should be regulations on the maximum number of *bada* that each tourist can purchase or the composition of the *bada*. It is best that regulations on recycling be developed as well. At the accident-prone spots there should be warning signs to prevent potential injury. In addition, there should be guidelines to encourage pastoralists to use oil, gas, electricity and other energy alternatives to replace wood fuel in order to retain the green landscape of the scenic area.

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3.4 Sustainable Cross-border Eco-tourism Strategy in the Tibetan Plateau Region

Dinesh Devkota¹⁴

Abstract

Situated above 5000 meters, the vast Tibetan Plateau fringed with deserts of the Tarim and Quidam basins in the north ascends southward to form the snow clad mountain chains of the Himalaya, Karakorum and Pamir – also considered as the ‘water tower’ of Asia. Nepal’s northern frontier shares part of this magnificent landscapes and unique natural heritage inhabited by people whose lives are mired with poverty, hunger, and deprivation. Economic activities are limited to subsistence agriculture, livestock and flimsy cross-border trade. Historical trade in salt and business that supported people in the poor landscape across the border is no longer feasible. The richness of the socio-cultural heritage and the distinct traditions that thrived for centuries in the once forbidden region has gradually slipped under the emerging human as well as natural stresses. The impact of the global environmental change is more pronounced in this region than elsewhere in the Himalayas. The challenge is to preserve the pristine but fragile bio-cultural diversity of the land and keep alive the unique cultural heritage with primary focus on improving living conditions. While both Nepal and Tibet, China are striving to develop economic opportunities, the area lacks other development potentials due to its harsh climate, rugged terrain and inaccessibility.

Though the development problems of border regions are often unique and hardly ever echoed in the process of the national planning, Nepal’s experiences show that the wilderness, inaccessibility and remoteness that pose constraints to development can be transformed into economic opportunity by promoting ecotourism or sustainable mountain tourism. Experience in Nepal shows that in order to support the regional trans-boundary ecotourism, it is important to have a long-term strategy or a reliable guiding document, community and ecosystem-based sustainable eco-tourism programme and good implementation plan in place. Such approach should also be based on public-private

14 Member, National Planning Commission, Government of Nepal. The author acknowledges the significant contribution of Mr. Tek Jung Mahat, Asia Pacific Mountain Network node manager, ICIMOD; Dr. Madhav Karki, Deputy Director General, ICIMOD, and Mr. Madhukar Upadhyya, President, Institute for Social and Environmental Transition – Nepal.

partnership. This approach in our view will provide a significant boost to the national and regional tourism and other associated support sectors by stimulating a wide range of local production systems, local income generating and employment opportunity, while addressing the emerging threats of climate and global change. Such multi-sectoral approach will also help conserve the unique ecosystems.

This paper highlights key issues that entail analysis in promoting ecotourism between Nepal and Tibet so as to address economic and environmental issues and foster care and support for culture, tradition and other human elements. The paper concludes that a sustainable ecotourism can also help build resilient pastoral societies that can, in a long-term successfully adapt to and mitigate climate change impacts in the Tibetan plateau.

1 Mountain Tourism in the Himalaya – Introduction

The Hindu Kush Himalayas have attracted foreigners, adventure travelers, and nature loving people from all over the world ever since these mountains have been opened for visitors. In Nepal, the modern era of tourism commenced in the early 1950s when Sir Edmund Hillary and Tensing Sherpa successfully climbed the Mount Everest or Mt. Chomologma. Despite the difficulty in travel during those early days of tourism, many western scholars and explores visited Nepal and wrote fascinating stories about the Himalayas, its people, and their unique culture and tradition. Michel Peissel, a French explorer was one of them who talked about the dreams of many visitors to explore the Himalayas in his book, *Mustang, the Forbidden Kingdom* in 1967, and said “the Gods live there, and for thousands of years, monks, priests, and scholars have gone there to die. The Himalayas for centuries past have fascinated all men, while still today their lofty peaks keep hidden many a mystery.” He further said “I was searching for something . . . for a dream, a dream that many have had before me. I dreamed of a lost horizon, and felt that somewhere there existed the last land unspoiled, untouched, and ageless– a world yet unexplored” (Peissel 1967). Many people do have similar dreams of exploring numerous features of this nature’s marvel that the gigantic Himalayan Mountains offer.

Globally, tourism is one of the fastest growing industries with direct and indirect impacts on environment, economy, socio-culture, technology and people – all dimensions of sustainable development (WRI 1993). Global tourism has increased from 25 million international arrivals in 1950 to 842 million in 2006, a more than 30-fold increase, with international arrivals expected to double to 1.5 billion by 2020. Mountains are important assets for the tourism

industry. They take up an estimated share of 15–20% of the global tourism market, generating between 100 and 140 billion USD per year.

With the highest and most famous mountain peaks of the world, its unique and rare flora and fauna, and a great variety of unique hill and mountain cultures, the Himalayas have become an incredible cultural, historic, adventure journey that one should make at least once in his lifetime. Mountains are a last refuge for many rare plants and animals eliminated from more transformed lowlands. They are vital to biodiversity conservation, and this unique feature of mountains makes them special place of interest (Figure 1). The tourism potential of the Himalaya region is beyond dispute, and is seen as a promising adaptation strategy, providing mountain people with alternative livelihood options, building on the strengths of the region. Tourism is one avenue where mountain specificities that are generally considered constraints to development – remoteness, difficult access, wilderness, insular cultures, and subsistence lifestyles – can be transformed into economic opportunities. Being labour intensive, having relatively high multiplier effects, and requiring relatively low levels of capital and land investment, tourism can yield significant benefits in remote and rural areas where traditional livelihoods are under threat.

Defined as environmentally responsible travel to experience the natural area and culture of a region while promoting economic contribution to local communities, ecotourism is becoming more contextual in fragile mountain areas to avoid possible negative effects of mass tourism and at the same time offering alternative livelihood options to mountain people and safeguarding their natural environment.

The government of Nepal (GoN) recognizes tourism as one of the major economic pillars to increase; national income, foreign currency earnings, employment opportunities and improving regional economic imbalances through the development and diversification of this sector. However, the benefit brought by tourism has so far been concentrated only in some pockets of eastern, central and western Nepal. A vast area, including the northern border region, remains least benefited from tourism. Developing tourism across the northern border regions can help improve the living condition of people as well as protect and conserve the environment of the region, which are facing increasing stress due to emerging climate change. This paper attempts to highlight some of the key features that need to be addressed to promote cross border ecotourism in the north.



Source: adapted from ICIMOD 2009

Figure 1: HKH regional map showing important biodiversity sites

2 Ecotourism-context of Nepal¹⁵

Nepal's combination of world class cultural and natural tourism attractions is well suited for international tourism, establishing tourism as a major contributor to Nepal's economy. Nepal is a land of great contrast; both in terms of landscape and its people. This is the place where two civilizations, Indic and Sinic; two religions, Hinduism and Buddhism; and two races, Caucasian and Mongoloid merge and making it a very special place for people interested in religions, cultures, landscapes and history. Government and the tourism industry have responded to problems in the sector by creating the Nepal Tourism Board (NTB) as a public/private sector partnership

There is much comfort in high hills
and a great easing of heart.

We look upon them, and our nature fills
with loftier images from their life apart.

They set our feet on curves of freedom bent
to snap the circles of our discontent.

Geoffrey Winthrop Young

¹⁵ The information presented here is adapted from the 'National Ecotourism Strategy and Marketing Programme of Nepal 2004'. Tourism for Rural Poverty Alleviation Programme Tourist Service Centre, Bhrikuti Mandap, Kathmandu.

organization with a mandate to undertake destination marketing, to broaden the tourism product base and to improve the quality of tourism services. Government has also liberalized aspects of the industry, including abolishing trek permits for the main trekking areas. Another indication of Nepal's sophistication in ecotourism is the Sustainable Tourism Network (STN). Founded in 1997 in order to coordinate the activity and programmes of agencies active in ecotourism, STN is serviced by NTB and has performed its way into being the key coordinating body of ecotourism planning and implementation. Key conservation and tourism related organizations and private sectors including International Centre for Integrated Mountain Development (ICIMOD), the World Conservation Union (IUCN), The Mountain Institute (TMI), World Wildlife Foundation (WWF), Eco Himal, SNV Nepal, Kathmandu Environmental Education Project (KEEP), National Trust for Nature Conservation (NTNC), Nepal Forum for Environmental Journalist (NEFEJ) etc. have the membership of this network. Some of these organizations are very actively promoting eco-region based conservation and tourism in the region.

Nepalese tourism industry, which faced decline after 1999, due to market perceptions of political instability, increased security activity and negative publicity based on several mishaps in the past few years, is now gradually recovering (Table 1).

Table 1: Tourist Arrivals and Average Length of Stay 1962-2009

Year	Total		By Air		By Land		Average Length of Stay
	Number	Annual Growth Rate %	Number	Percent	Number	Percent	
1962	6,179	0					
1963	7,275	17.7		-	-		
1964	9,526	30.9	8,435	88.5	1,091	11.5	
1965	9,388	-1.4	8,303	88.4	1,085	11.6	
1966	12,567	33.9	11,206	89.2	1,361	10.8	
1967	18,093	44.0	15,064	83.3	3,029	16.7	
1968	24,209	33.8	19,717	81.4	4,492	18.6	
1969	34,901	44.0	28,130	28.1	6,771	19.4	
1970	45,970	31.7	36,508	79.4	9,462	20.6	
1971	49,914	86.0	40,369	80.9	9,545	19.1	
1972	52,930	6.0	42,484	80.0	10,446	19.7	

Year	Total		By Air		By Land		Average Length of Stay
	Number	Annual Growth Rate %	Number	Percent	Number	Percent	
1973	68,047	28.6	55,791	82.0	12,256	18.8	
1974	89,838	32.0	74,170	82.6	15,668	17.4	13.20
1975	92,440	2.9	78,995	85.5	13,445	14.5	13.05
1976	105,108	13.7	90,498	86.1	14,610	13.9	12.41
1977	129,329	23.0	110,180	85.2	19,149	14.8	11.60
1978	156,123	20.7	130,034	83.3	26,089	16.7	11.84
1979	162,276	3.9	137,865	85.0	24,411	15.5	12.02
1980	162,897	0.4	139,387	85.6	23,510	14.4	11.18
1981	161,669	-0.8	142,084	87.9	19,585	12.1	10.49
1982	175,448	8.5	153,509	87.5	21,939	12.5	13.33
1983	179,405	2.3	152,470	85.0	26,935	15.0	11.53
1984	176,634	1.5	149,920	84.9	26,714	15.1	10.55
1985	180,989	2.5	151,870	83.9	29,119	16.1	11.30
1986	223,331	234.0	182,745	81.8	40,586	18.2	11.16
1987	248,080	111.0	205,611	82.9	42,469	17.1	11.98
1988	265,943	7.2	234,945	88.3	30,998	11.7	12.00
1989	239,945	-9.8	207,907	86.6	32,038	13.4	12.00
1990	254,885	62.0	226,421	88.8	28,464	11.2	12.00
1991	292,995	15.0	267,932	91.4	25,063	8.6	9.25
1992	334,353	14.1	300,496	89.9	33,857	10.1	10.14
1993	293,567	-12.2	254,140	86.6	39,427	13.4	11.94
1994	326,531	11.2	289,381	88.6	37,150	11.4	10.00
1995	363,395	11.3	325,035	89.4	38,360	10.6	11.27
1996	393,613	8.3	343,246	87.2	50,367	12.8	13.50
1997	421,857	7.2	371,145	88.0	50,712	12.0	10.49
1998	463,684	9.9	398,008	85.8	65,676	14.2	10.76
1999	491,504	6.0	421,243	85.7	70,261	14.3	12.28
2000	463,646	-5.7	376,914	81.3	86,732	18.7	11.88
2001	361,237	-22.1	299,514	82.9	61,723	17.1	11.93

Year	Total		By Air		By Land		Average Length of Stay
	Number	Annual Growth Rate %	Number	Percent	Number	Percent	
2002	275,468	-23.7	218,660	79.4	56,808	20.6	7.92
2003	338,132	22.7	275,438	81.5	62,694	18.5	9.60
2004	385,297	13.9	297,335	77.2	87,962	22.8	13.51
2005	375,398	-2.6	277,346	73.9	98,052	26.1	9.09
2006	383,926	2.3	283,819	73.9	100,107	26.1	10.20
2007	526,705	37.2	360,713	68.5	165,992	31.5	11.96
2008	500,277	-5.0	374,661	74.9	125,616	25.1	11.78
2009	509,956	1.9	379,322	74.4	130,634	25.6	11.32

Source: Government of Nepal. Ministry of Tourism and Civil Aviation 2010: Tourism Statistics 2009

The Government of Nepal (GoN) has declared 2011 as Nepal Tourism Year to promote tourism and increase the number of tourists visiting Nepal from the current level of half a million to over one million a year. The government recognizes the potential of tourism in developing the nation, improving living standards and reducing poverty. Tourism provides direct and indirect employment to people from all walks of life, including the educated and illiterate as well as the rich and the poor. The records show that employment provided by tourism increased from 257,000 in 1997 to 500,000 in 2007 (Table 2). The earning from tourism grew steadily over the years and reached about 200 million dollars in 2003 (Dhakal 2005).

Table 2: Employment contribution of tourism

Year	Direct contribution (number of persons employed)	Direct and indirect contribution (number of persons employed)
1997	75,000	257,000
2001	80,000	NA
2007	200,000	500,000

Source: NTSA 2008

2.1 Purpose of visit

Nepal offers something for every visitor. Table 3 shows the number of tourist arrival from 1997 till 2007 and the purpose of their visit. Tourists coming for holiday pleasure are the highest in number. Trekking and mountaineering constitute about 21 percent. Holiday pleasure combined with trekking and mountaineering totals about 70 percent of total arrivals. Pilgrimage constitutes about 7 percent of total tourist arrival (Figure 2). A substantial number of visitors also come for business and official purposes. In addition, Nepal has gradually emerged as a preferred location for organizing international conferences and seminars.

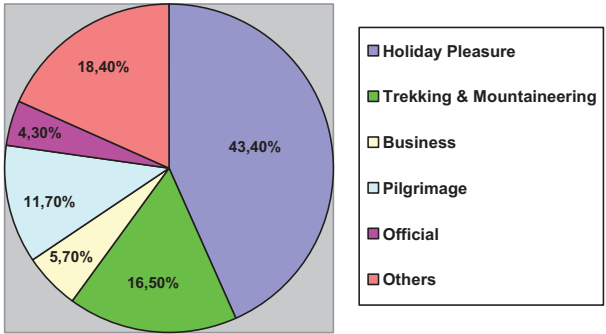
Table 3: Number of tourists and purpose of visit (1997–2007)

Year	Holiday Pleasure	Trekking Mountaineering	Business	Pilgrimage	Official	Conference	Total
1997	249360	91525	27409	4068	24106	5824	402292
1998	261347	112644	24954	16164	22123	5181	442413
1999	290862	107960	23813	19198	24132	5965	471930
2000	255889	118780	29454	15801	20832	5599	446355
2001	187022	100828	18528	13816	18727	NA	338921
2002	110143	59279	16990	12366	17783	58907	275468
2003	97904	65721	19387	21395	21967	111758	338132
2004	167262	69442	13948	45664	17088	71893	385297
2005	160259	61488	21992	47621	16859	67179	375398
2006	145802	66931	21066	59298	18063	72766	383926
2007	228000	86000	30000	61000	22000	96841	523841

Source: Ministry of Culture, Tourism and Civil Aviation, 2006, www.tourism.gov.np/ and Nepal Tourism Sector Analysis, UP ZRS, 2008, URL: http://asiantour.progetti.informest.it/market_analysis/nepal.pdf

It is a suitable location for holding regional training and workshops for the SAARC countries. Conference and meetings bring about 12 percent of visitors. Knowledge about purpose of visit helps in improving services and facilities for tourists coming for different purposes, as well as in developing new destinations to suit tourists' preferences.

The number of tourists coming for holiday pleasure declined rapidly during political mayhem but picked up when normalcy returned.



Source: Nepal Tourism Board 2007, quoted from Nepal Tourism Sector Analysis 2008,

URL: http://asiantour.progetti.informest.it/market_analysis/nepal.pdf

Figure 2: Visitors' Purpose (1997-2007)

The next category, which is rising relatively faster, is the tourists coming for pilgrimage. Unlike holiday or trekking destination, no new religious site can be created.

According to the preliminary findings of “Nepal departing visitor’s survey-2008”, however, the trend differs in some categories. The findings indicate that the adventure tourism has grown from 6% in 2005 to 24% in 2008.¹⁶ This is partly due to addition of exotic tourist activities. Rough water rafting, and paragliding has attracted adventure sports lovers and Nepal has comparative advantage in these areas.

2.2 Major Tourism Activities

Nepal is only 147,141 square kilometer in area, but the variety of tourist activities it offers is incredible. Major tourist activities include mountaineering, trekking, mountain flights, rock climbing, para-gliding, rafting/canoeing, bungy jumping, and mountain biking and jungle safari. Even though the permanent snow-line varies according to aspect and gradient, the land above 5,000–6,000 meters is usually covered by snow and ice offering ultimate challenge to thousands of aspiring mountaineers. Over 300 snow covered peaks are open for mountaineering. These mountains have also been places of attraction to saints, philosophers, researchers and adventure lovers. At lower altitudes, trekking is quite common where one can experience Nepal’s unbeatable combination of

16 Nepal Tourism Board 2008.

natural and cultural heritage. Trekking lasting from few days to weeks through isolated villages, farms, orchards, protected forests, and religious sites in the hills offers opportunity to explore Nepal and its traditional rural life. There are well developed infrastructures for trekking in selected areas of Khumbu, Langtang and Annapurna regions. For those who have limited time or those who are unable to walk for days, the one-hour mountain flights operated daily provide a lifetime experience of getting closer to the snow clad peaks. Watching the famous mountain peaks including the summit of the Everest in the foreground with the Tibetan plateau in the background is a thrilling experience. Back in the mountains, rafting or canoeing in the rough water of the cascading rivers takes one through the typical cross section of natural as well as ethno-cultural heritage of Nepali society.

Jungle safari is another activity mostly popular in the parks and reserves in the southern plains where one can watch one-horn rhino and Bengal tigers in the wild at stone throwing distance. Nepal has dedicated about 19 percent of its land area for nature conservation by declaring parks and reserves. Chitwan and Bardia National Parks in Tarai are famous for jungle safari. Protected areas in the mountains include Annapurna Conservation Area and Sagarmatha, Kanchenjunga, and Rara National Parks.

Taking comparative advantage of its geographical settings, Nepal has also developed exotic tourist activities. Recent addition includes bungy jumping, paragliding, and mountain biking. These activities are popular among adventure lovers.

Nepal also offers numerous religious sites with temples and monasteries. These sites are visited by both Hindu and Buddhist visitors from all over the world for pilgrimage. In addition, various festivals and religious ceremonies observed frequently in villages and towns portray a blend of culture and religion that carries message of age old harmony and tolerance of various faiths.

2.3 Ecotourism prospects

Eco-tourism is one of several branches of tourism. Unlike jungle safari or nature tourism, eco-tourism is a double edged sword with two-pronged benefits (Lindsay 2003, Nepal 2007, Thapa 2005). Nepal's National Ecotourism Strategy and Marketing Programme (2004) defines ecotourism as 'any style and type of tourism that has the potential to bring benefits to the local economy whilst contributing to natural and cultural resource conservation.' Nepal's mountains have continued to attract increasing numbers of visitors. Among Nepal's unique styles of ecotourism, most famous is mountain trekking. Recognized as a major

part of the industry, trekking in the Nepal Himalaya involves people walking either alone or accompanied by trekking agents' support staff and staying in either local houses or tents. This type of tourism activity has proven itself able to spread tourism benefits to areas that are only accessible on foot. About 43 percent of all international leisure arrivals now go trekking, which consistently rates highly amongst visitors from the West. Annapurna Conservation Area (ACAP), Sagarmatha (Everest) National Park (SNP) and Langtang National Park (LNP) are recorded as the most preferred trekking areas. Similarly mountaineering expeditions are other key tourism activities in the Nepalese highlands followed by village tourism, a relatively new style of ecotourism.

Unlike other branches such as mountaineering and adventure sports, ecotourism respects the environment and encourages and promotes the well-being of local people. For that reason, ecotourism has also been seen in different forms such as Alternative Tourism, Sustainable Tourism, Community based Tourism, Responsible Tourism, Pro-Poor Tourism, Village Tourism, and Cultural Tourism. Ecotourism in Nepal has been used as a pro-poor strategy in rural regions lacking in other economic development potential (Thapa 2005). National Ecotourism Strategy and Marketing Programme developed in 2001 lays out seven strategic directions that reflect the shared experiences of all the agencies and private sector organizations associated with ecotourism development. The strategic direction sets forth the key areas of concerns including Nepal's experiences in ecotourism development, role of partnerships and alliances with partner agencies, government and private sector involvement, need for new area development, and ecotourism marketing.¹⁷

2.4 Institutional arrangements

The GoN has given adequate attention for tourism development in the country by establishing institutional arrangements. The National Planning Commission (NPC), the apex planning body of the GoN, has included tourism as poverty reduction strategy in its periodic plans. The Ministry of Culture Tourism and Civil Aviation (MoCTCA) is responsible for implementing the policy, licensing and regulation of the tourism industry. The Nepal Tourism Board (NTB) undertakes planning and product development, international and domestic promotion, and tourism research.

In addition, Nepal has highly developed networks of private organizations promoting tourism. They include the Trekking Agents Association of Nepal

17 National Ecotourism Strategy and Marketing Programme of Nepal 2001, Part One : National Ecotourism Strategy <http://www.discovernepal.com.np/pdf/nationalEco2001.pdf>

(TAAN), Nepal Mountaineering Association (NMA), Nepal Association of Travel Agents (NATA), Hotel Association of Nepal (HAN), Nepal Association of Tour Operators (NATO), Nepal Association of Rafting Agents (NARA), and Tourist Guide Association of Nepal (TURGAN).

2.5 Prospects for ‘repeat’ visitors

Tourism industry in South Asia is expected to have a tourism growing at 5% compared to 4.1 % global growth. Nepal is well placed to take advantage of the regional projections of growth in tourism in the region. It is indicated by the fact that the number of tourist arrivals has already crossed even the optimistic figures for 2010 made by the Nepal Tourism Board in 2004 (Table 4). The GoN realizes that if Nepal is to benefit from the global trend, we need to attract more ‘repeat’ visitors by opening new destinations that are less explored and different from the usual ones.

Table 4: Projection of visitors’ arrivals

Description / Year	2010	2015	2020
Conservative	517,982	606,659	710,518
Medium	615,655	898,299	1,433,455
Optimistic	632,045	972,398	1,609,157

Source: Nepal Tourism Sector Analysis, 2008,

URL: http://asiantour.progetti.informest.it/market_analysis/nepal.pdf

The government has already proposed some new destinations. They include Antu Dada and Surrounding Areas (Ilam), Basantapur and Surrounding Areas (Terhathum), Dhanusha Dham and Surrounding Areas in Tarai, and Tansen and Surrounding Areas. Similarly, it has also identified some new areas in the high mountains. They include Khaptad and Surrounding Areas, Kanchenjunga Region, and Dolpa, Humla. Nonetheless, tourism, as with other development sectors, is no longer content within a fix boundary of nations. Nepal also has good prospects for developing cross-border tourism along its northern border. Crossing the Trans-Himalayan region to land into the Tibetan plateau is a life-time experience. An approach to promote cross-border tourism will help build synergy between the efforts of the Government of Peoples’ Republic of China and that of the GoN in promoting tourism in the region. The cross border tourism in the northern frontier can be used to invite repeat visitors, which can be instrumental in supporting local economy and preserve the environment.

2.6 Cross border tourism in the northern Tibetan frontier region

Most of the northern frontier of Nepal is remote. The climate is harsh. The land remains covered by snow in winter for few months. Rain shadow areas have sparse vegetation with isolated pockets of alpine vegetation. The area is inhabited by Tibetan-speaking groups namely Sherpa, Dolpo, Lopa, Baragaunle, and Manangi. The Baragaunle and Lopa live in the cold semi-deserted areas of Upper and Lower Mustang. The Dolpo live in Dolpa district of West Nepal isolated villages are located at 4,000 meters. Since they can grow only one crop a year due to moisture and temperature stress, people have traditionally dependent on raising goats and sheep as well as on trade that they conduct during winter in low lying areas of Nepal and in India. Poverty is acute in the border areas. Natural vegetation is declining due to pressure for firewood and grazing. Demand for firewood is so acute that people burn animal dung to keep them warm. Livelihood suffers from low productivity and limited access to services and information. However, things have changed in areas such as Mustang where eco-tourism has developed. Eco-tourism has helped in reducing poverty.

Known as Khawachen – ‘Land of snow’, ‘the roof of the world’, ‘The Forbidden Kingdom’ and ‘Land of enchantment’ by others, Tibet is land unlike any others. The Tibetan Plateau is a vast, elevated highland, whose average elevation exceeds 5000 m (Fielding et al. 1994). It is bounded by the deserts of the Tarim Basin and Qaidam Basins to the north and the Himalayan, Karakoram, and Pamir mountain chains to its south and west. Its eastern margin is more diffuse and consists of a series of alternating deep forested valleys and high mountain ranges that run approximately north-south, bounded by the lowlands of the Sichuan Basin of China.¹⁸

There is an aura of mystic that surrounds Tibet because of its inaccessibility, austere environment and powerful Buddhist culture. And while Tibet remains a special and fantastic land, it is now a place that may be visited and explored by anyone who is willing to endure to its evaluations. A drive across Tibet is a journey across the moon; the landscape will look like infinite variations on the colour brown. The roads are rough, dusty, unending but never dull.¹⁹

18 Geology of the Tibetan Plateau, <http://oak.ucc.nau.edu/wittke/Tibet/Plateau.html>. (accessed 4 October 2010).

19 Treks & Tours in Tibet Himalayas, Loben Expeditions. <http://www.lobenexpeditions.com/tibet/index.php> (accessed 4 October 2010).

3 Mountain Pastoralism in the Himalayas

Nomadism has been portrayed as one of the great advances in the evolution of mankind. It is an adaptation by people to grassland areas of the world where the raising of livestock is more supportive of human life than the growing of crops. People who specialize in livestock production requiring periodic movements of their herds are known as nomadic pastoralists, or, simply nomads. The survival of nomads on the Tibetan Plateau and Himalaya provides examples of nomadic practices that were once widespread throughout Asia and Africa, but are now increasingly hard to find. As such, these portraits of nomads offer a rare glimpse into a way of life that is rapidly vanishing. The lives of the nomads are tuned to the growth of the grass and the seasonal pulse of the grazing lands. The grasslands provide the theatre in which the nomads and their animals interact to make a living. Over centuries, the nomads acquired complex knowledge about the environment in which they lived and upon which their lives depended, which enabled them to persist in one of the most inhospitable places on earth. But, they did more than just survive. The nomads created a unique, vibrant culture, about which, even today, so little is known (Miller 2010).



Source: adapted from ICIMOD 2009

Figure 3: Trans-boundary landscapes and transects in the HKH region.

4 Nepal-Tibetan Plateau Linkages

Development of cross-border ecotourism combining Nepal Himalaya and Tibetan Plateau is much more than trekking, mountaineering and visiting Protected Areas and major high altitude cities like Kathmandu, Pokhara and Lasha. Rather it is blending of spectacular landscapes, breathtaking sceneries, natural heritages, unique habitat of plants and animals, magnificent temples, mountain passes, snow-capped peaks, nomad camps, pilgrims and much more, this is truly a journey to stir the senses and nourish the soul – of all the destinations in Asia, the most sacred and sublime (Figure 3).

According to the China Species Information System, ten Nature Reserves have been established in Qinghai Province; Kekexili, Mengda, Qinghaihu niaodao (Qinghai Lake Bird Island), Longbao, Sanjiangyuan, Baokushui yuanlin, Dongxiashui yuanlin, Chaidamusuo suolin, Kelukehu-tuo suohu and Geermuhu yanglin.

There are other 24 Nature Reserves established in Tibet Autonomous Region (Xizang); Mangkang, Jiangcun, Zhangmu kouan, Dongjiu, Bajie, Gangxiang, Pengbo heijinghe, Zhumulangmafeng (Mt. Everest), Qiangtang, Shenzha, Motuo, Ximalaya (Himalaya), Jianglianghe jizhoubian diqu heijinghe, Leiwuqi (Riwoche), Chayuci bagou, Selincuo heijinghe, A'langsi bubai chunlu, Yaluzangbu daxiagu (Yarlung Tsangpo Gorge), Yaluzangbujiang zhongyouhegu heijinghe, Lalu shidi, Namucuo, Rikaze yanrong, Dagejiapen quanqun and Zhadatulun. Similarly according to DNPWC, there are nine Protected Areas in the Nepal side, namely Rara National Park (NP), Shey-Phoksundo NP, Dhorpatan Hunting Reserve, Annapurna NP, Manaslu Conservation Area, Langtang NP, Sagarmatha NP, Makalu-Barun NP and Kanchenjunga NP. Altogether this makes Nepal-Tibetan Plateau area world's one of very diverse and biologically important zone.

Interestingly there are number of high passes between Nepal Himalaya and Tibetan Plateau, some of which are very popular among the tourists and some others need extra promotion. For example, Everest High Pass Trekking in Everest Region is now considered to be one of the best journeys in the world, combining a strenuous trek with extremely rewarding cultural and ecological experiences. Kongma La Pass 5540 m south west of Everest and straight above the Dingboce, ChoLa Pass 5335 m situated west of Everest Base Camp, Lobuche and north east of Gokyo and the newly explored Pass Renjo La Pass 5400 m South of Gokyo and northwest of Namche/Thame are the major three passes of Everest region. Kongma La is a beautiful pass, from where we can view the dramatic Mt. Thamserku, Mt. Amadablam, and Mt. Kongtega and glacial

Lakes just a few kilometers distant. Cho La Pass has become a commonly used pass, because during peak season 40 to 50 people cross from Gokyo to Everest Base Camp and from base camp to Gokyo. The difficulty is similar to Kongma La Pass and Cho La Pass, on to the western side of pass, from the top (Gokyo Side) is a hard ascent for approx 200 m. Renjo La pass is much majestic than other passes, the north ridge and south ridge of Mt. Everest is clearly displayed. You can shoot pictures from Renjo Pass of Gokyo village with a charming blue lake, huge glacier, ChoLa Pass in the Lap of Everest and Mt. Makalu in one shot including numerous other mountains. After crossing the pass, we come across the amazing remote valley. We view to the west more mountains than can be seen from Gokyo and Everest Base Camp.

5 Regionalisation and the Great Himalayan Trail

Taking a regional approach to tourism marketing by combining promotional efforts is now widely acknowledged as providing economies of scale, added value and sharing power unattainable by individual destinations. Advantages include the stretching of budgets, faster growth in destination awareness, greater media exposure, earlier product positioning, more effective branding and allegiance building, and more rapid penetration into target markets. Opportunities for regional cooperation provided by Nepal's linkages with Tibet and SAARC members, and the Quadrangle (Nepal, Bhutan, Bangladesh and India) should be enthusiastically embraced.

The 'Great Himalayan Trail' concept has emerged from discussions with the industry as having merit with both a marketing and development rationale. The idea of a cross Nepal trail (and indeed stretching on into neighbouring countries) linking the popular trek areas like a 'string of beads' could encourage visitation, provide a market focus to remote valleys, and bring tourism income to neglected valleys between link the current popular trek areas. There is no obvious one and only Great Himalayan Trail; rather market forces will decide what are the preferred options between the easiest middle hills route, the more challenging alpine route and the extreme mountaineering route.

Launch of the Great Himalayan Trail concept is expected to broaden the trek product in Nepal and, particularly to establish the improved trek areas of Humla, Dolpa, Makalu Barun and Kanchenjunga, and eventually linking these mountainous regions with broadening sections of neighbouring countries, most importantly Tibetan Plateau Region (TPR) and India. Great Himalayan Trail, the longest and highest alpine walking track in the world is scheduled to be inaugurated on 14 January 2011 in Kathmandu.

6 Way forward

Ecotourism programme in the HKH region should contribute to poverty reduction, sustainable development and bio-cultural heritage conservation through the development and /or promotion of innovative tourism infrastructures. ICI-MOD has been planning Himalayan Heritage routes and new tourism circuits, consisting of a network of outstanding trails for responsible nature tourism, linking up regionally significant elements of the rich cultural and natural heritage of the Greater Himalaya Region. The programme links poverty reduction, development and heritage conservation through an integrated innovative livelihood perspective. The focus of activities is on the knowledge generation and dissemination, training and capacity building, policy development, and regional coordination between key tourism stakeholders in the Greater Himalaya region (Kruk 2010).

A joint effort between the Government of TAR, China, and Nepal is necessary to promote ecotourism in the Himalayan Tibetan region. One promising cross-border tourism possibility is in the Mount Kailash Sacred Landscape which has world famous and sacred peaks of Kailash as well as the famous high altitude lake – Mansarovar, which is the source of four major rivers of the HKH region – Indus, Brahmaputra, Sutlej, and Karnali. The greater Mt. Kailash area represents a sacred landscape significant to over a billion people in Asia and around the globe, and considered holy by at least five religions, including Hinduism, Buddhism, Bon Po, Jainism, and Sikhism. This sacred landscape attracts tens of thousands of pilgrims every year. Religious and spiritual pilgrims from around the world undertake the arduous journey to this sacred mountain, coming primarily through India, Nepal, and from other parts of the Tibetan Plateau. The development of a model regional tourism programme in this sacred landscape will be model for other HKH countries.

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>>> 4 Niche Production as an Additional Asset for Pastoralism and Rangeland Management

4.1 Pastoralism as a Contributor to Niche Production and Services

Madhav Karki and Nirmal Bhattarai²⁰

Abstract

In the context of increasingly globalized mountain economy, Tibetan Plateau region – influenced by a successful agriculture and tourism sectors – is harnessing the potentials of niche products using its pristine range and pasture landscape by the nomadic farmers. Pastoralism, especially its good practice, is vital for conserving large areas of natural eco-systems in this region. Accessing markets by sustainably producing diverse niche products and services for supplementing their livelihood means is one such practice. With a trend of rapid increase in global demands for natural products, production and marketing of niche products and services contributed by diverse systems, pastoralism has good prospects for increasing the income of pastoralists and foragers in the region. The nomadic life-style helps widespread sharing of good practices and refinement of traditional knowledge which now has become internationally recognized. Livestock grazing play an important role in the fertility and

20 Both authors are affiliated with ICIMOD, Kathmandu

distribution of plants, by scarifying seeds in their guts, transporting them over great distances and fertilizing the ground where they are deposited. As a result, pastoralism has created environments that are favourable to specific plant and animal species to produce quality products.

Pastoral niche production covers both plants and animal-based products including meat and meat products, dairy products, raw woollen products, and harvesting and primary processing of medicinal herbs. Medicinal plants not only play a pivotal role in providing primary healthcare for pastoralists, increasingly these niche products are being gathered, processed and sold in national and international markets. Prominent examples of high value medicinal plants that are commonly used in the Tibetan system of traditional medicine (*Soya Rigpa*) are: *Ophiocordyceps sinensis*, *Neopicrorhiza scrophulariiflora*, *Picrorhiza kurrooa*, *Nardostachys grandiflora*, *Dactylorhiza hatagirea*, *Podophyllum hexandrum*, *Aconitum* spp. etc. Experience gathered to date suggests that technical, socio-economical, institutional and policy inputs are required to develop niche production in pastoral systems. This paper analyses and recommends the following actions in future: a) raising awareness through different formal and informal education means; b) skill development in sustainable harvesting as well as grazing management; c) production of organic and sustainably managed niche products; d) integration of agricultural and pastoral livelihoods with off-farm activities through value-chain development of major niche products that have high value capturing potential. e) improvement of degraded pasture lands to enhance productivity of niche products and services; f) conservation through sustainable-use oriented policy and legal reforms to implement integrated strategies of linking conservation of wild fauna and flora with sustainable pastoral production systems; and g) expansion of ecologically sensitive low-input high-return tourism, using pastoralists to provide services, particularly through their indigenous knowledge and improved local production practices.

1 Background

Human well-being is strongly dependent upon ecosystem services provided freely by nature and its vast biodiversity wealth. Many of these goods and services are public property, and as such they do not have a market price as the market system mainly rewards resource owners and suppliers for the benefits of ecosystem conversion and use. As a result, ecosystem degradation and biodiversity loss is often not detected by our current market system. Currently, a variety of pressures resulting from population growth, globalization of economy, changing diets, urbanization, acculturation and climate change is causing additional strain on ecosystem conservation and management of natural resources

further accelerating ecosystem degradation and biodiversity decline (Bhattarai and Karki 2010). It is, therefore, topical to study and evaluate the various goods and services provided by the ecosystem and the natural resources therein and the possible adverse effects caused by various human activities to maintain a balance between resource utilization and economic growth within the particular ecosystem.

Against this background, the present paper aims to address the status and key issues concerning pastures, pastoralism and niche products and services in the Himalayas and recommend few action points.

2 The HKH Region and the Tibetan Plateau

The Hindu Kush Himalayan (HKH) region is one of the world's richest ecosystems in terms of biodiversity, with about 12,500 species of higher plants (Dobremez 1996) and four out of 34 biodiversity hotspots in the world. Grasslands occupy a large portion of the region's land surface and are important as a feed source for livestock, as a habitat for wildlife, a regulator for environmental protection and for the *in situ* conservation of genetic resources. Rangelands cover two million km² of the Hindu Kush Himalayan region that include large parts of Afghanistan, Pakistan and the vast expanses of the Tibetan Plateau, which reaches out into India, Nepal and Bhutan. These rangelands have great influence on the welfare and economy of the rangeland dependent pastoral societies. This vast area is supporting the livelihoods of millions of pastoral population and their livestock.

3 Pastures, Pastoralist and Pastoralism in the Himalayas and the Tibetan Plateau

Pastoralism is often the dominant livelihood of the diverse human communities occupying the Himalayan and the Tibetan plateau regions. Subsistence agriculture supplemented by livestock and rangeland and nearby forest products continues to be the main occupation of the Himalayan and Tibetan pastoralists. Pastoral livestock are an integral part of the environment in which they are reared, and in most cases they have played a major role in the development of their environment. Those environments are often highly diverse, and both livestock and livestock managers have contributed to that diversity through systematic resource use and management techniques, such as burning and pollarding by livestock keepers, and grazing and trampling by livestock. Rangelands play an important role in determining the socio-economic condition of rural people (NPC 1993), but rangelands in this region are under

heavy grazing pressure, thereby causing the depletion of the resource which has resulted into feed shortage and hence the livestock productivity (Jha 1991).

Pastoralism is vital for conserving large areas of natural habitats. In rangeland environments, mobility is a pre-requisite for effective natural resource use as pastoralism is also a resource conservation and management strategy. Livestock grazing play an important role in the fertility and distribution of plants, by scarifying seeds in their guts, transporting them over great distances and fertilising the ground where they are deposited. The selective grazing and browsing of livestock and the active management by herders influences the distribution of plants and enables a wide diversity of plants to thrive. As a result pastoralism has modified grasslands and created environments that are favourable to certain kinds of wildlife species.

4 Promotion and Management of Pastures and Pastoralism

Well managed rangelands have diversified grass species and higher carrying capacity (Hermans and Vereijken 1995) and well managed pasture is the most cost effective feeds that could be produced and utilized in the region. A very significant proportion of the region's rangelands have been brought under protection in the form of national parks and conservation areas. This has increased the roles and responsibilities of the pastoralists in the conservation and sustainable management of the area. For example, the Department of National Parks and Wildlife Conservation (DNPWC), Nepal has developed a new approach to protected area management through changing its management regime from 'traditional' park management to 'participatory' park management. Consequently there has been a shift from traditional 'wildlife-centered' to more 'participatory people-oriented' management regimes. In line with the new approach, 'protecting park against the people' has been shifted to 'involving people in park management'; 'standard park management' approaches have been replaced by systems that build on 'local management systems'; and 'wildlife protection' has been shifted to 'integrating resource management and biodiversity conservation'. This approach has motivated the traditional herders and pastoralists in many rangeland areas to organize themselves into grazing user groups (GUG) with declared rights and responsibilities. The committees of the GUGs have their own funds and the objective is to promote local-level networking for promoting collaboration, maintaining health of the ecosystems and promoting biodiversity conservation and management of their sites. In principle, the objective and procedures of formation and functioning of the GUGs are the same as for the community forest user groups (CFUGs).

5 Pastoralism-based Niche Products and Services

The Himalayan and Tibetan pasturelands are rich repositories of bio-diverse resources and contain many niche products of high market values. A range of mountain high value products and services (HVPS), such as medicinal and aromatic plants (MAPs), different types of wild mushrooms, nuts, berries, indigenous honey-bees, eco-tourism, and ecological services are attracting the attention of range managers as well as development planners due to their high economic values and often low volumes, examples include different types of mushrooms including *Ophiocordyceps sinensis* and morels (Photo 1).



Photo 1: Morel (*Morchella conica*) as a valuable food crop
(photograph © Bhattarai 2006)

Pastoral productions include both animal and plant-based products. Animal products include cattle hides and pelts, and yak's tail – locally called *chamar* is considered sacred and highly traded for use in Tibetan monasteries and Hindu temples during worships. Other animal products include meat and meat products, and dairy products. Dairy products include curd (fermented milk), butter (obtained from diluted churned or stirred-up curd), different types and grades of raw cheese prepared from yak-milk based curd, and *chburpi* and other milk products. Carpets and rugs weaved from sheep wool are the major raw

wool-based products. Plant-based products include various edible wild plants, spice and condiments and medicinal plants.

5.1 Food plants

Due to their inhabitation in remote areas accompanied by nomadic lifestyle, the pastoralists have acquired extensive knowledge and experiences on wild spices, condiments and food plants available in their rangelands and pastures. These are used regularly by the pastoralists to supplement their diet while some of these constitute their major food item. Major wild spices and condiments include plants like *Allium* spp., *Carum carvi*, *Heracleum nepalense*, *Mentha longifolia*, *Ferula asa-foetida*, *Oxalis corniculata*, *Thymus linearis*, etc. Many of these are also used in traditional medicines.

Many species of *Allium* are dried and sold or bartered in the villages and markets in the name of *jimbu* largely used to flavor curry and pickles. While majority of *Allium* species are endemic to the Himalaya, *Allium hysistum*, the most preferred *jimbu* is endemic to Central Nepal. *Carum carvi* and *Ferula asa-foetida* are also items of regular collection, use and trade.

Majority of the wild food plants collected by the pastoralists belong to the under-utilized wild crop category. Some of the wild edible plant, notably *Allium* species, *Aconogonum molle*, species of fern including *Diplazium stoliczkae*, *Dryoathyrium boryanum*, *Dryopteris cochleata* and *Polystichum squarrosus*, are also brought to the local markets for sale. Table 1 (in the annex) includes a list of frequently used spices, condiments and wild food plants by the pastoralists and nomads.

A number of wild plants are also preserved after some primary processing and fermentation. A prominent example of fermented plant-based niche product includes *gundruk* which is produced after fermenting leafy vegetables. *Gundruk*, mostly consumed as a soup, can also be made into fresh pickle (Bhattarai 1991). While almost every leafy vegetable can be made into *gundruk*, a number of wild leafy vegetables, notably *Gerardiana diversifolia*, *Rheum australe*, *Phytolacca acinosa*, *Capsella bursa-pastoris*, *Chenopodium album*, *Arisaema flavum*, *Urtica dioica*, *Malva verticillata*, etc., are also fermented and made into *gundruk*. In the same trend, chipped tender bamboo shoots are fermented to prepare *tama* that can also be dried for future uses. Both *gundruk* and *tama* have their own typical flavour and taste that can be preserved for two or more years depending upon the storage conditions (see Table 1).



Photo 2: *Podophyllum hexandrum* of which the root and rhizome are collected as medicinal plants (photograph © Bhattarai 1994)

5.2 Medicinal plants

The rangeland specific medicinal plants have been providing health care services and facilities to thousands of the local pastorals and their families. Many of these medicinal plants species are specific to the rangeland habitats and a number of them have high commercial demands in adjoining countries as well as abroad. High altitude rangelands, pastures and adjoining forests and shrubland are the most suitable habitats for a large number of medicinal plants that are widely used in almost all systems of traditional medicines including Tibetan system (*Sowa Rigpa*), traditional Chinese medicines, Ayurvedic system, Unani system, and many others. Some of these, notably *Ephedra gerardiana*, *Podophyllum hexandrum* (Photo 2), etc., are also used in the modern systems of medicines or allopathy. Table 2 (in the annex) provides a list of important medicinal plants available in the high-altitude pastures and rangelands while considerable details on some commercially valued medicinal plants such as *Ophiocordyceps sinensis*

(Photo 3), *Nardostachys grandiflora* (Photo 4), *Neopicrorhiza scrophulariiflora*, *Picrorhiza kurrooa*, *Dactylorhiza hatagirea* (Photo 5), *Delphinium himalayai* (Photo 6) and *Aconitum* spp.



Photo 3: Cordyceps (*Ophiocordyceps sinensis*), one of the most valuable items of niche production (photograph © Bhattarai 2010)



Photo 4: *Nardostachys grandiflora* of which the root and rhizome are used (photograph © Bhattarai 2009)



Photo 5: *Dactylorhiza hatagirea*; a ground orchid endemic to the Himalaya and the rhizome is extensively used in Arabian countries to prepare an aphrodisiac drug called salep (photograph © Bhattarai 2009)



Photo 6: *Delphinium himalayai*; a highly reputed and traded Himalayan medicinal plant locally called atis, endemic to Central and West Nepal (photograph © Bhattarai 2009)

5.3 *Ophiocordyceps sinensis*

Ophiocordyceps sinensis (Yartsagumba) is one of the high-value low volume organic medicinal products with increasing international markets and reported only from parts of four Himalayan countries along the Tibetan plateau – China, Nepal, Bhutan and India. It is the result of a parasitic relationship between the fungus and larva of the ghost moth (*Thitarodes* spp.). Both the moth and fungus are endemic to the high altitude pastures of the Himalaya and Tibetan plateau regions. Initially collected and used by the herdsmen in the areas of its occurrence, *O. sinensis* has recently become one of the most valued natural medicinal materials.

Till date, attempts to propagate *O. sinensis* have not been successful. Although China and some western countries have succeeded in developing asexual culture of the fungal mycelium in various media that does not include the host caterpillar, this has not been successful to replace the natural products

demand and hence *O. sinensis* continues to be the most expensive rangeland specific niche product. China's annual production is estimated at about 100 tons followed by Nepal (four to five tons), Bhutan (one ton) and India (500 kg), respectively (Bhattarai 2010; cf. chapter 4.2 in this volume).

The price paid by the local traders to collectors in Nepal in 2008 was NRs 350,000/kg (about 4,700 USD) while the same in 2009 was 250,000 (Chhetri 2010). The high-altitude pastoralists have long been the major collectors of the fungus that have been vital for improvements in their livelihoods.

5.4 *Nardostachys grandiflora*

Nardostachys grandiflora is endemic to the Himalaya occurring in Uttarakhand (India), Nepal and Tibet (south-west China) between 3600–4800 m altitudes. The roots and rhizomes constitute the drug *spikenard* used in almost all systems of traditional medicines to treat a large number of health problems including hysteria, epilepsy, heart diseases, colic, etc. Apart from medicinal uses, recently the product has entered into the European markets for the perfumery products. Nepal is believed to be the largest supplier of the medicinal raw material to the international markets with the production of about 200 tons per annum (IRG 2006) followed by China and India, respectively. Being a rangeland product its collection has contributed high to the pastoralists to improve their livelihoods.

5.5 *Neopicrorhiza scrophulariiflora*

Neopicrorhiza scrophulariiflora (Pennell) D.Y. Hong is endemic to the Himalaya distributed in Uttarakhand (India), Nepal, Bhutan, Myanmar and Tibet (China) between 3500–4800 m altitudes. The rhizomes constitute the drug material used in all systems of traditional medicines. Major diseases treated are fevers, jaundice, anemia, dropsy, bile disorders anorexia, etc.

Bhattarai and Olsen (2000), while investigating the national importance of medicinal plant trade in Nepal, recorded the legal trading of Kutki from the country to be 260 tons in 1997/98 (Olsen 2001). Bhattarai (2007) also reported that about 26 tons of dried raw materials were illegally exported to Tibet (China) from the Taplejung district (eastern Nepal) alone in 1998/99. This and many other medicinal plant species are also recorded to have been unofficially exported to Tibet from the western districts of Nepal, the focal destination being the town of Taklakot in Tibet (Bhattarai 2007). Nepal is the largest producer of the species, almost all collections being exported legally or illegally. Being a rangeland product its collection has contributed high to the pastoralists to improve their livelihoods.

5.6 *Picrorhiza kurrooa* Royle ex Benth

Picrorhiza kurrooa is the west Himalayan species distributed in Pakistan to Uttarakhnad (India) and Tibet between 3300–4300 m altitudes. The roots and rhizomes constitute the drug material and are used in all systems of traditional medicines. Its therapeutic properties are recorded to be identical with those of *Neopicrorhiza scrophulariiflora*. This is a CITES-listed species with limited area of production but with high commercial demand, the collection and trade of which has long been supporting the livelihoods of the nomads and pastoralists.

5.7 *Dactylorhiza hatagirea*

Dactylorhiza hatagirea (D. Don) Soo is endemic to the Himalaya distributed in Pakistan, India, Nepal and south-east Tibet along 2800–4000 m altitudes. The rhizome constitutes the drug material used in all systems of traditional medicines and are used to treat urinary and bowel complaints. It is also used as a tonic, expectorant, and astringent.

Although legally protected in Nepal, the species is regularly collected and illegally traded and hence its collection and trade has always been secretive. Nepal is thought to be the largest producer of this species; almost all collections are exported illegally. In addition to being used in the various codified systems of traditional medicines, a significant proportion of the collection from Nepal reaches the Arabian countries where it is used to prepare the drug ‘salep’ considered to be an aphrodisiac. Being a scarce rangeland product its market value is high and hence its collection has contributed high to the pastoralists to improve their livelihoods.

5.8 *Delphinium himalayai*

Delphinium himalayai Munz. is endemic to Nepal and occurs at 3000–4500 m in the western and central parts of the country in sub-alpine and alpine grasslands. Popularly known as *Nepali atis*, it is a well-reputed medicinal plant. The rhizome is used in various Ayurvedic medicinal preparations as well as local healing procedures. It is said to have astringent properties and is used in dyspepsia, diarrhea, dysentery, cough and cold, and as a tonic. Being an endemic species having limited range of distribution and increasing commercial demands, the pastoralists and nomads have been benefited from the collection and trade of this valuable medicinal plant.

5.9 *Aconitum* spp.

Various species of *Aconitum* are used in all systems of traditional medicines and, like many other medicinal plant species, are the niche products of the high-altitude rangelands.

Aconitum of commerce is usually a mixture of dried roots of a number of *Aconitum* species. At least ten species of *Aconitum* are collected from different altitudes of the rangeland for commercial purposes. Three species of commercially valued *Aconitum* (*A. angulatum*, 3800–4200 m; *A. balangranse*, 3800–4000 m and *A. nepalense*, 4000–6000 m) are endemic to Nepal while others (*A. balfouri*, 3700–4000 m; *A. bisma*, 3000–4000 m; *A. ferox*, 2100–3800 m; *A. gammiei*, 3300–4300 m; *A. heterophyllum*, 3200–3700 m; *A. lacianatum*, 3800–4600 m; and *A. spicatum*, 1800–4200 m) are endemic to different regions of the Himalaya and the Tibetan plateau. Due to their availability in very high altitude localities, accompanied by increasing price of the raw material, the pastoralists have been benefited high from its collection and trade.

6 Discussion

Rangelands have great influence on the welfare and economy of pastoral society. In the Tibetan plateau region the linkage between rangelands and the people is more intense due to higher dependence of the people for their livelihoods. In general, use of rangeland for enhancing the animal production is viewed as a means of improving the quality of rural life although managing rangelands and planning for sustainable pasture development in high altitude regions like the Himalaya and Tibetan plateau are challenging.

Major issues faced by pastoralists and farmers involved in production and marketing of niche products are: a) lack of market information and market infrastructure to manage their products, b) lack of skill and capacity to produce marketable products in increasingly competitive and globalised markets, c) lack of the capacity and capability to organise, negotiate, and sustain pastoral community's comparative advantages in producing and marketing niche products and services to distant markets, d) lack of the knowledge to develop a sustainable livelihood systems, e) lack of access to simple technologies and credit, and d) absence of supportive policies and institutional framework to promote niche products.

Value chain development strategies of select products need to start with a focus on the mobilisation and organisation of collectors, producers, and service providers to participate in different value chain development pilots. Such pilots can provide a regional platform for developing and sharing knowledge and

information on value chains, build the capacities of local and national partners, develop good practices in value chain development for a range of niche products and services, and highlight the significance of regional cooperation in harnessing the potential of mountain niches.

As the baseline element of the ecosystem approach it has to be recognized that humans, with their cultural diversity and traditional knowledge and practices, are an integral component of ecosystems. Sustainable use of rangeland for enhancing animal production can be considered as a means of improving the quality of rural life. Pastoralists often move their herds to better grazing areas before the current area is completely depleted, because the likelihood of obtaining higher foraging returns elsewhere seems more economical. Nomads and pastoralists have been the pioneer collectors and traders of various niche products including medicinal plants in the Himalaya and the Tibetan plateau region. In the rangelands, where biological resources are relatively abundant and other income generating opportunities are limited, medicinal plants offer a good prospect for enhancing the livelihood and income of local communities. Yet, the opportunities are tapped on a limited scale due to lack of entrepreneurial capabilities, marketing knowledge, and financial resources.

Technical problems are not the main ones facing pastoralism and transhumant herding; the major ones are socio-economic. Although the pastoral system in the region has remained functional for a long period of time, it cannot always serve as a model for the future. Sustainable livelihood approaches should be central to understanding and addressing the diverse factors that influence poverty and general well-being of the pastoralists. Livelihood enhancement and diversification has been recognized, by conservationists and development practitioners alike, as a mechanism to promote rural livelihood development. It is obvious that there is an increasing tendency of the pastoralists to become more diversified and settled. Use of pasture land for rain fed agriculture is an increasingly widespread phenomenon in most parts of the Tibetan plateau. In the hope of getting a quick return, the pastures are ploughed up that destroys the indigenous vegetation, paving ways to ecosystem alteration. This practice has led to significant degradation of pasture land, both quantitatively as well as qualitatively. While this is an important coping or risk mitigation strategy, this however, needs to be improved with scientific knowledge or good practices prevalent elsewhere. The aim would be to continue building on and maintaining their traditional good practices but remain adaptive to the climate and socio-economic changes which are occurring in the Tibetan plateau and Himalayan regions.

Another point to make is that both men and women play important roles in the conservation and management of pasturelands including its use of niche production systems. Cultural practices and societal norms, prevalent in the Himalaya and Tibetan plateau region impact on rural women's mobility, their access to market and information and thus their capacity to get better economic benefits. Indigenous knowledge and experience of both men and women are important in framing strategies and hence there should be clear understanding and improvement of gender roles and responsibilities in the sector.

While environmental adversities such as change in weather pattern have always existed, they are now aggravated by climate change. Livelihood diversification and creating increasing options for income enhancement is central to helping pastoralists and transhumant herders to cope with natural hazards and adapt to climate change. As climate change becomes more obvious and part of the ecosystem factors, there is a need for doing a more dynamic analysis of ecological and socio-environmental systems in an integrated and scientific manner recognizing both the constraints and opportunities.

The activities, previously conducted by and limited to pastoralists, have now been conducted by other land users and outsiders as well. As international trade in medicinal plants has grown to a multi-billion dollar industry, the local harvesting patterns have shifted from subsistence local collection to commercial mining without regard to the regeneration of species for future yields in most cases including not only quantitative increase in harvesting but also destructive harvesting, unscientific harvesting, pre-mature harvesting, etc. (Bhattarai and Croucher 1996). In other words, the wild collection system that was previously sustainable has now been threatened – an example being that of *Ophiocordyceps sinensis*. The growth in the alternative medicine market in industrialized nations is a significant contributor to this trend (Bhattarai and Karki 2004b). With the rise in income of the urban population, the demand for natural products has gone up domestically as well.

Pastoralism is vital for conserving large areas of natural habitats. Where pastoralism is practiced effectively, and where local knowledge and institutions are effectively mobilised, the environmental outcomes are positive. However, where local institutions are undermined, and traditional knowledge is limiting, pastoral environments are easily degraded. The future of pastoralism has been shaped by many distinctive twentieth century influences, which confound a return to some prior or imagined conditions. Such influences include, for example, losses of prime grazing land to cultivation, gazetting of pastoral lands for conservation and political, economic and social marginalization and simple conversion of rangeland for urban settlement and recreation. It is possible

nonetheless to ensure that appropriate policies, legal mechanisms, and support systems are in place to enable pastoralists to enhance the economic, social and ecological sustainability of their livelihoods which includes but not only limited to conservation and management of mountain specific niche products including medicinal plants.

7 Lessons learned and suggested Way forward

It is often argued that economic growth, especially pro-poor growth indicated by increased annual household income provides a reasonable indicator of development. However, economic development in pasture lands has to go beyond the fulfilment of basic needs by including the element of bicultural conservation and individual economic freedom to decide what is best livelihood pursuit for the pastoralists and their society. The protection of cultural heritage is quite important for pastoralists. Therefore, it can be argued that promotion of niche products and services not only provides cash income but also promotes diversified livelihood options and cultural preservation.

Experience gathered to date suggests that the sustainable development of mountain niche products and services requires a holistic and multi-disciplinary approach. Integration of technical, socio-economical, institutional and policy inputs are needed to develop niche production in pastoral systems. Some of the lessons learned are as follow:

Pastoral livelihood development by adapting to changes: Awareness-raising, skill development and knowledge sharing through both the formal and informal education means are necessary to understand the potential value of niche resources and transferring new knowledge and practices. Hands-on training and capacity development in range resource development, sustainable harvesting as well as systematic grazing management can lead to sustained and quality products including of organic niche products. Since nomadic system is declining, integration of agricultural and pastoral livelihoods with off-farm activities should be promoted through value-chain development of major niche products.

Niche products Marketing: The concept of value chain development and application is new to the range and pasture lands. Here also, awareness raising and capacity building play the key role. Global and regional experience indicates that the promotion of value chains for pastoral niche products with a pro-poor vision calls for mixed institutional collaboration with governmental institutions as the regulators of the policy and legal framework, knowledge and applied research institutions such as ICIMOD for back-stopping and technical

expertise, and community-based enterprises and small businesses to equitably integrate small-scale producers and service providers into the value chain.

Conclusion and recommendations: This paper has analysed various constraints and opportunities that exist in Tibetan pastoralism. The overriding conclusion is that Tibetan pastoralism is undergoing transformation and diversification while maintaining traditional and cultural values and systems seem to be a clear trend. Therefore the authors recommend the following actions for improving the changes already happening with a view that these changes are dynamic and adaptive to rapid climatic and socio-economic changes: a) raising awareness through different formal and informal education means; b) skill development in sustainable harvesting as well as grazing management; c) production of organic and sustainably managed niche products; d) integration of agricultural and pastoral livelihoods with off-farm activities through value-chain development of major niche products that have high value capturing potential. e) improvement of degraded pasture lands to enhance productivity of niche products and services; f) conservation through sustainable-use oriented policy and legal reforms to implement integrated strategies of linking conservation of wild fauna and flora with sustainable pastoral production systems; and g) expansion of ecologically sensitive low-input high-return tourism, using pastoralists to provide services, particularly through their indigenous knowledge and improved local production practices.

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Table 1: Rangeland specific edible wild plants, spices and condiments

Botanical name and family	Part used	Specific uses
<i>Aconogomum molle</i> (D.Don) Hara (Polygonaceae)	Tender shoot	Vegetable, pickle
<i>Aesculus indica</i> (Colebr. ex Cambess.) Hook. (Hippocastanaceae)	Cotyledons	Edible
<i>Allium carolinianum</i> DC. (Amaryllidaceae)	Leaves	Vegetable, condiment
<i>Allium fasciculatum</i> Rendle (Amaryllidaceae)	Leaves	Vegetable, condiment
<i>Allium hypsistum</i> Stearn (Amaryllidaceae)	Leaves	Vegetable, condiment
<i>Allium oreoprasum</i> Schrenk (Amaryllidaceae)	Leaves	Vegetable, condiment
<i>Allium prattii</i> C.H. Wright apud Forbes&Hemsl (Amaryllidaceae)	Leaves	Vegetable, condiment
<i>Allium tuberosum</i> Rottl. ex Sprengel (Amaryllidaceae)	Leaves, bulb	Vegetable
<i>Allium wallichii</i> Kunth (Amaryllidaceae)	Leaves	Vegetable, condiment
<i>Arisaema costatum</i> (Wall.) Mart. ex Schott (Araceae)	Rhizome	Vegetable
<i>Arisaema flavum</i> (Forsk.) Schott (Araceae)	Tender shoot, rhizome	Vegetable
<i>Arundinaria falcata</i> Nees (Poaceae)	Tender shoot	Vegetable
<i>Benthamidia capitata</i> (Wall.) Hara (Cornaceae)	Ripe fruits	Edible
<i>Berberis aristata</i> DC. (Berberidaceae)	Ripe fruits	Edible
<i>Berberia asiatica</i> Roxb. ex DC. (Berberidaceae)	Ripe fruits	Edible
<i>Cannabis sativa</i> L. (Cannabinaceae)	Seeds	Pickle, edible oil
<i>Capsella bursa-pastoris</i> (L.) Medikus (Cruciferae)	Tender leaves	Vegetable
<i>Carum carvi</i> L. (Umbelliferae)	Seeds	Spice
<i>Chenopodium album</i> L. (Chenopodiaceae)	Tender shoot	Vegetable
<i>Coraria nepalensis</i> Wall. (Coriariaceae)	Ripe fruits	Edible

Botanical name and family	Part used	Specific uses
<i>Dactylorhiza hatagirea</i> (D. Don) Soo (Orchidaceae)	Rhizome	Edible
<i>Dioscorea deltoidea</i> Wall. ex Griseb. (Dioscoreaceae)	Rhizome	Edible
<i>Diplazium stoliczkae</i> Bedd. (Aspidiaceae)	Tender fronds	Vegetable
<i>Dryoathyrium boryanum</i> (Willd.) Ching (Aspidiaceae)	Tender fronds	Vegetable
<i>Dryopteris cochleata</i> (D. Don) C. Chr. (Aspidiaceae)	Tender fronds	Vegetable
<i>Elaeagnus parvifolia</i> Wall. ex Royle (Elaeagnaceae)	Ripe fruits	Edible
<i>Fagopyrum dibotrys</i> (D. Don) Hara (Polygonaceae)	Tender shoot	Vegetable
<i>Fagopyrum tataricum</i> (L.) Gaertn. (Polygonaceae)	Tender shoot	Vegetable
<i>Ferula asa-foetida</i> L. (Umbelliferae)	Gum resin	Spice, condiment
<i>Girardinia diversifolia</i> (Link.) Friis (Urticaceae)	Tender shoot	Vegetable
<i>Heracleum candicans</i> Wall. (Umbelliferae)	Seeds, Root	Spice
<i>Heracleum nepalense</i> D. Don (Umbelliferae)	Seeds	Spice
<i>Hippophae salicifolia</i> D. Don (Elaeagnaceae)	Ripe fruits	Edible
<i>Hippophae tibetana</i> Schlecht. (Elaeagnaceae)	Ripe fruits	Edible
<i>Houttuynia cordata</i> Thunb. (Saururaceae)	Tender shoot	Vegetable
<i>Holboellia latifolia</i> Wall. (Lardizabalaceae)	Ripe fruits	Edible
<i>Juglans regia</i> L. (Juglandaceae)	Cotyledons	Edible
<i>Lilium nepalense</i> D. Don (Liliaceae)	Bulbs	Eaten boiled
<i>Lindera pulcherrima</i> (Nees) Benth. ex Hook.f. (Lauraceae)	Ripe fruits	Edible
<i>Malva verticillata</i> L. (Malvaceae)	Tender leaves	Vegetable
<i>Meconopsis grandis</i> Prain (Papaveraceae)	Seeds	Pickle
<i>Mentha longifolia</i> (L.) Hudson (Labiatae)	Leaves	Pickle, spice
<i>Ophioglossum nudicaule</i> L.f. (Ophioglossaceae)	Leaves	Vegetable

Botanical name and family	Part used	Specific uses
<i>Osyris wightiana</i> Wall. ex Wight (Santalaceae)	Leaves	Tea
<i>Oxalis corniculata</i> L. (Oxalidaceae)	Leaves	Pickle
<i>Phytolacca acinosa</i> Roxb. (Phytolaccaceae)	Tender leaves	Vegetable
<i>Podophyllum hexandrum</i> Royle (Berberidaceae)	Ripe fruits	Edible
<i>Polystichum squarrosus</i> (D.Don) Fee (Aspidiaceae)	Tender fronds	Vegetable
<i>Prinsepia utilis</i> Royle (Rosaceae)	Seed oil	Edible
<i>Prunus cerasoides</i> D.Don (Rosaceae)	Ripe fruits	Edible
<i>Pyracantha crenulata</i> (D.Don) M.Roemer (Rosaceae)	Ripe fruits	Edible
<i>Pyrus pashia</i> Buch.-Ham. ex D.Don (Rosaceae) (Schisandraceae)	Ripe fruits	Edible
<i>Rhododendron arboreum</i> Smith (Ericaceae)	Flowers	Pickle
<i>Rheum australe</i> D. Don (Polygonaceae)	Petiole	Pickle, curry
<i>Rorippa nasturtium-aquaticum</i> (L.) Hayek (Cruciferae)	Tender shoot	Vegetable
<i>Rosa macrophylla</i> Lindl. (Rosaceae)	Ripe fruits	Edible
<i>Rosa sericea</i> Lindl. (Rosaceae)	Ripe fruits	Edible
<i>Rubus calycinus</i> Wall. ex D. Don (Rosaceae)	Ripe fruits	Edible
<i>Rubus ellipticus</i> Smith (Rosaceae)	Ripe fruits	Edible
<i>Rubus fockeannus</i> Kurz (Rosaceae)	Ripe fruits	Edible
<i>Rubus foliolosus</i> D. Don (Rosaceae)	Ripe fruits	Edible
<i>Rumex hastatus</i> D.Don (Polygonaceae)	Tender leaves	Vegetable
<i>Schisandra grandiflora</i> (Wall.) Hook.f. & Thoms.	Ripe fruits	Edible
<i>Stellaria monosperma</i> Buch.-Ham. ex D. Don (Caryophyllaceae)	Tender shoot	Vegetable
<i>Thymus linearis</i> Benth. (Labiatae)	Leaves	Spice, condiment
<i>Urtica dioica</i> L. (Urticaceae)	Tender leaves	Vegetable

Table 2: Rangeland specific commercially valued medicinal plants

Plant species and family	Plant parts valued
<i>Aconitum angulatum</i> Tamura (Ranunculaceae)	Root
<i>Aconitum balangranse</i> Lauener (Ranunculaceae)	Root
<i>Aconitum balfouri</i> Stapf (Ranunculaceae)	Root
<i>Aconitum bisma</i> (Buch.-Ham.) Rapaics (Ranunculaceae)	Rhizome
<i>Aconitum ferox</i> Wall. ex Seringe (Ranunculaceae)	Rhizome
<i>Aconitum gammiei</i> Stapf (Ranunculaceae)	Rhizome
<i>Aconitum heterophyllum</i> Wall. ex Royle (Ranunculaceae)	Rhizome
<i>Aconitum lacianatum</i> (Bruhl) Stapf (Ranunculaceae)	Rhizome
<i>Arnebia benthamii</i> (Wall. ex G. Don) I.M. Jognston (Boraginaceae)	Root and rhizome
<i>Berberis aristata</i> DC. (Berberidaceae)	Root bark
<i>Berberis asiatica</i> Roxb. ex DC. (Berberidaceae)	Root bark
<i>Dactylorhiza hatagirea</i> (D.Don) Soo (Orchidaceae)	Rhizome
<i>Delphenium himalayai</i> Munz. (Ranunculaceae)	Root
<i>Dioscorea deltoidea</i> Wall. ex Griseb. (Dioscoreaceae)	Rhizome
<i>Ephedra gerardiana</i> Wall. ex Stapf (Ephedraceae)	Stem
<i>Ephedra intermedia</i> Schrenk & Meyer (Ephedraceae)	Stem
<i>Ephedra sinica</i> Stapf. (Ephedraceae)	Stem
<i>Ferula aasa-foetida</i> L. (Umbelliferae)	Gum resin
<i>Juglans regia</i> L. (Juglandaceae)	Root bark
<i>Lilium nepalense</i> D. Don (Liliaceae)	Bulb
<i>Maharanga emodi</i> (Wall.) A. DC. (Boraginaceae)	Root and Rhizome
<i>Maharanga bicolor</i> (Wall.) A. DC. (Boraginaceae)	Root and Rhizome
<i>Nardostachys grandiflora</i> DC. (Valerianaceae)	Root and Rhizome
<i>Neopicrorhiza scrophulariiflora</i> Pennell (Scrophulariaceae)	Root
<i>Ophiocordyceps sinensis</i> (Berk.) G.H. Sung, J,M.Sung, Hywell-Jones & Spatafora (Clavicipitaceae)	Whole plant
<i>Parnassia nubicola</i> Wall. ex Royle (Parnassiaceae)	Root

Plant species and family	Plant parts valued
<i>Paris polyphylla</i> Smith (Liliaceae)	Root and Rhizome
<i>Picrorhiza kurrooa</i> Royle ex Benth. (Scrophulariaceae)	Root
<i>Podophyllum hexandrum</i> Royle (Berberidaceae)	Root and Rhizome
<i>Rheum australe</i> D. Don (Polygonaceae)	Root
<i>Rhododendron anthopogon</i> D. Don (Ericaceae)	Leaves
<i>Swertia chirayita</i> (Roxb. ex Fleming) Karsten (Gentianaceae)	Aerial parts
<i>Valeriana jatamansii</i> Jones (Valerianaceae)	Rhizome

4.2 Contribution of *Cordyceps sinensis* to Tibetan Pastoralist Income and Problems in its Sustainable Use

Wang Mu, Kampot Tashi, Zhuoga, Dan Ba²¹

Abstract

Cordyceps sinensis is one of the unique biological resources that grow in the Tibet Autonomous Region. According to estimations, Tibetan *Cordyceps* constitutes about 80% of the income of farmers and herdsmen. *Cordyceps sinensis* is exported and distributed in 41 counties within six prefectures and cities respectively. The total revenue from *Cordyceps sinensis* in 1999 was equivalent to 6.35% of the GDP derived from agriculture, forestry, animal husbandry and fishery and 15.72% in 2007. The average annual contribution of income from *Cordyceps sinensis* to proceeds from the agricultural sector in Tibet reached 10.84% during the period of 1999–2007. *Cordyceps sinensis* contributes to agricultural development in different parts of Tibet, to varying degrees. The largest contribution made is in Nagqu, with Qamdo and Nyingchi (or Linzhi) coming in second and third. However, due to pasture degradation caused by overgrazing and the disorderly excavation of *Cordyceps sinensis*, the habitat for the fungus and its insect host, *Hepialus minyuancus*, has seen serious damage and degradation, having a negative impact on the sustainable utilisation of *Cordyceps sinensis*.

In this context a lack of supervision of the harvesting process and a lack of decent regulation of the market is triggering a series of social and environmental issues. The authors make a few suggestions on the sustainable use of *Cordyceps sinensis* in Tibet. First, based on credible research of the distribution and production of *Cordyceps sinensis* in Tibet, unified resource utilization policies and regulations should be developed as soon as possible and market supervision needs to be strengthened. Second, environmental education should be vigorously promoted to increase awareness of the relationship between *Cordyceps sinensis* exploitation and environmental protection. Third, we should take effective measures to ensure better management of resources. For instance, regulators should specify time periods for the collection and excavation of *Cordyceps* when they issue a

21 All authors are affiliated with Tibet Agriculture and Animal Husbandry College Linzhi. The research for this paper was supported by the National Science and Technology Support Project (2007BAI32B04).

permit. Fourth, we should strengthen research efforts focused on Tibetan *Cordyceps sinensis* resources. Fifth, we should coordinate with other *Cordyceps sinensis* production bases in the surrounding area to build relationships and formulate a common index system for quality evaluation.



Photo 1: Cordyceps for sale in Lhasa
(photograph © Hermann Kreutzmann, October 27, 2010)

1 Introduction

Cordyceps sinensis (called *yartsa gunbu*²² in Tibetan) is one of the unique biological resources of the Tibetan Plateau. It was first mentioned as early as the fifth century in Tibetan medical records. *Cordyceps sinensis* has been designated as a China Class II endangered and rare species under state protection. In recent years, as people's living standards have improved, there has been an increasing demand for *Cordyceps sinensis*, resulting in its price skyrocketing (Photo 1). It has become the most important source of income for farmers and herdsmen at its places of origin and collection. However, because of the disorderly excavation of *Cordyceps*, the suitable habitat for the fungus and its insect host, *Hepialus*²³

22 In recent years *yartsa gunbu* was attributed to *Ophiocordyceps sinensis* (cf. chapter 4.1 in this volume) in contrast to the classical *Cordyceps sinensis*. In the framework of this paper the classical approach is adopted and followed.

23 Taxonomically *Hepialus* was attributed to *Thitarodes*, cf. for detailed information on it <http://blog.mushrooming.com/2010/03/24/the-ghost-of-hepialus-haunting-high-asia-and-beyond.aspx>

minyuncus, has seen extreme destruction, seriously affecting the sustainable excavation and use of *Cordyceps sinensis*. This paper provides an analysis of some of the problems in resource development and utilization.

2 Resource Distribution of *Cordyceps sinensis*

Cordyceps sinensis is only found in four countries of the world: China, Bhutan, India and Nepal. *Cordyceps sinensis* resources in China are mainly found in the more than 100 counties of Tibet, Qinghai, Sichuan, Gansu and Yunnan at 3500 to 5000 m above sea level. According to a survey of the six cities/prefectures of origin in Tibet, a total of 41 counties produce *Cordyceps sinensis*, including six counties in Lhasa (Damxung, Qushui, Doilungdeqen, Dazi, Maizho and Kunggar), eleven counties in Qamdo (Changdu, Jiang Da, Gongjue, Riboche, Dengqen, Chaya, Basu, Zogang, Markam, Lhorong and Bianba), eight counties in Shannan (Naidong, Sangri, Qusum, Cuomei, Luozha, Gyaca, Takako and Cona), five counties in Shigatse (Tingri, Dingjie, Yadong, Gyirong and Nyalam), six counties in Nagqu (Nagqu, Jiali, Biru, Rongnie, Sog and Baqing) and six counties in Nyingchi (Nyingchi, Gongbo'gyamda, Milin, Bomi, Zayu and Lang) (Figure 1).

Cordyceps sinensis is a complex fungus formed out of a mummified insect and *Cordyceps* fungi parasitized in *Hepialidae* larva. (*Ophiocordyceps sinensis*, Anamorph: *Hirsutella sinensis*) Recent studies have found that *Cordyceps* fungus can produce a variety of bioactive substances of important medical value (Li Zeng-Zhi et al. 2000). It has been recorded that 400 species of *Cordyceps* fungi exist all over the world. China alone has 60 species. They parasitize in larva, pupa and adults of nine different orders of insect. Some people mistakenly call all of the fruiting bodies of host insects attacked by any parasitic *Cordyceps* fungus. Actually, *Cordyceps sinensis* is the only genus of the 400 *Cordyceps* species.

Chinese scholars have been carrying out a series of systematic studies on *Cordyceps sinensis* since 1958. Specifically, comprehensive studies have been done on the species and the distribution, habits, biology and ecology of the host, a ghost moth; the relationship between *Hepialus* insects and host plants; the identification of *Cordyceps sinensis* fungus; biological characteristics; cultivation methodology and molecular identification of the anamorph and teleomorph of *Cordyceps sinensis* fungus.²⁴ The scholars have confirmed that the *Hirsutella sinensis* is the anamorph of *Cordyceps sinensis*.

24 Zhao Jin et al. 1999; Liu Zhuoyi 1999; Wang Ning et al. 2000; Jiang Yi & Yao Yijian 2004; Zhang Li Jian et al. 2010.



Source: Winkler, D. 2008, 2010

Figure 1: Distribution area of Yartsa gunbu (*Cordyceps sinensis* on *Thitarodes*) on the Tibetan Plateau

3 Impact of *Cordyceps sinensis* on the Income of Farmers and Herdsmen and local economic Development

Cordyceps sinensis has become the main source of revenue for local farmers and herdsmen in Tibet. According to our survey, more than 80% of farmers' incomes in collecting areas are derived from the caterpillar fungus. Table 1 shows that, in alignment with the continuous increase of *Cordyceps sinensis* revenue, its contribution to agriculture in Tibet has also been gradually increasing. The period from 1999 to 2007 saw an average annual share in earnings of 11.28% in the agricultural sector in Tibet. *Cordyceps sinensis* in 1999 was equivalent to an output value of 6.35% in relation to the total income of animal husbandry and fishery, and it reached 15.72% in 2007.

Table 1: Contribution of *Cordyceps sinensis* revenue to agricultural development in Tibet

Year	Total revenues from <i>Cordyceps Sinensis</i> (in million Yuan)	Total revenues of agriculture, forestry, animal husbandry (in million Yuan)	Contribution rate of <i>Cordyceps Sinensis</i>
1999	306.1	4821.5	6.35%
2000	323.1	5121.8	6.31%
2001	461.7	5277.9	8.75%
2002	615.7	5588.7	11.02%
2003	633.9	5863.4	10.81%
2004	808.7	6273.7	12.89%
2005	870.1	6774.1	12.84%
2006	904.4	7047.6	12.83%
2007	1254.6	7983.1	15.72%
Average	686.5	6083.5	11.28%

Source: Data in were derived from a survey conducted by the Office of Rangeland Management, Department of Agriculture and Pastoralism, TAR 2009

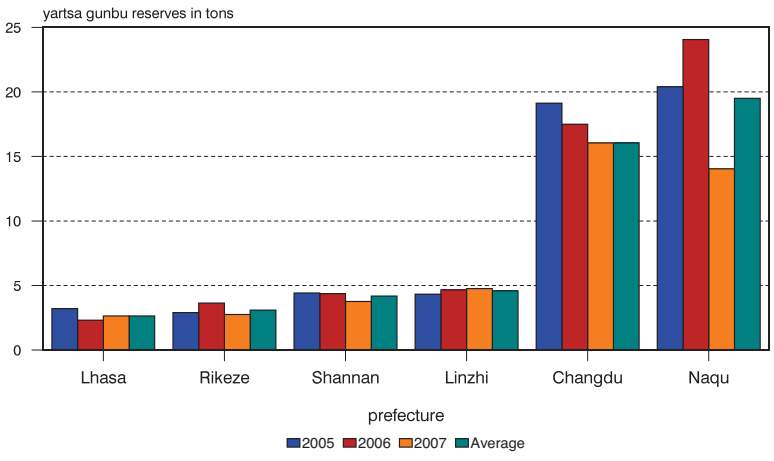
Figures from different prefectures show that *Cordyceps sinensis* in different parts of Tibet contribute differently to agricultural development. The largest contribution made is in Nagqu (38.83%), with Qamdo (or Changdu with 31.95%) and Nyingchi (or Linzhi with 9.12%) coming in second and third place.²⁵ This is due to the different output levels of *Cordyceps sinensis* in different areas (cf. Figure 2). The benefits derived from *Cordyceps sinensis* collection for farmers and herders also varies from place to place. In Nagqu, 80% of farmer income comes from *Cordyceps sinensis*. The coverage of *Cordyceps sinensis* in the TAR is 6500 million *mu*, with a resource capacity of about 65–70 tons per year. The annual output has been maintained at 40 to 50 tons. With the current market price of approximately 100,000 Yuan per kilo, the annual output value of *Cordyceps sinensis* in the TAR should be four to five billion Yuan.

25 Data provided by the Office of the Rangeland Management, Department of Agriculture and Pastoralism TAR 2009.



Photo 2: Trading of collected Cordyceps in front of Lhasa Mosque (photograph © Hermann Kreutzmann, October 27, 2010)

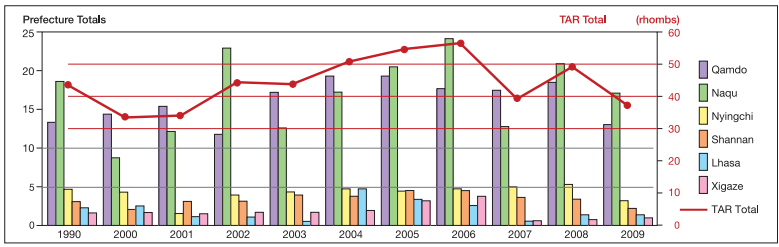
However, this amount should be interpreted with caution. The collection and sale of caterpillar fungus mostly relies on private collectors, usually controlled by farmers and pastoralists, as well as local and outside traders (Photo 2). Most of the transactions consist of small quantities. Therefore, there are no accurate statistics available on the volume of collection and sales. Household surveys have only revealed and supported rough estimates. Nevertheless, the rough estimates reflect the economic impact on farmers and herdsmen to a certain degree. According to investigations by Luorong Zhandui et al. (2006) there are more than 750,000 farmers and herdsmen in the Tibet Autonomous Region, whose main source of income is dependent upon the collection of the caterpillar fungus, including 200,000 from Nagqu; 450,000 from Qamdo and 100,000 from other areas of prevalence. With appropriate caution, it can be said that *Cordyceps sinensis* has become an important source of income for farmers and pastoralists on the Qinghai-Tibet Plateau. Recently, our research group conducted a series of randomized household surveys. In Garang Village of Bahe Town of Gongbo'gyamda County, Nyingchi Prefecture, there are 14 households. The village is located along the No. 318 State Expressway. In 2010, nine households had revenue of over 30,000 Yuan from *Cordyceps sinensis*; four households above 20,000 Yuan and one household above 10,000 Yuan. However, only four households had an average annual income from agricultural production of 5,000 Yuan, and the other ten had less than 4,000 Yuan annually.



Source: data from the Office of Rangeland Management, Department of Agriculture and Pastoralism, TAR 2009

Figure 2: Cordyceps yields in selected Tibetan prefectures 2005–2007

There are big differences in current estimates of the annual output of *Cordyceps sinensis* due to different calculation methodologies and test locations (Figure 3). Experts and local people disagree with each other in their estimates of the trend of annual production capacity of *Cordyceps sinensis* as well. The general expert opinion is that the over-exploitation is causing a downward trend in production capacity of *Cordyceps sinensis*. The local people, on the other hand, believe that the excavation process of one year will not affect the production capacity of the next.



Source: Winkler 2010: 47, all figures are given in metric tons

Figure 3: Output of Cordyceps sinensis in selected prefectures of Tibet 1990 to 2009

Farmers and herdsmen generally agree that the output is very much related to the climatic conditions of the previous year. As long as there is plenty of precipitation and thick snow cover in one year, a big harvest is bound to happen in the next year. There has also been an increasing coverage of *Cordyceps sinensis* in recent years. Many of the mountain areas where no *Cordyceps sinensis* was found earlier seem to produce now. This could be caused by rising temperatures and abridged precipitations patterns.

4 Management of *Cordyceps sinensis* Resources

In 2006 the People's Government of the Tibet Autonomous Region promulgated Governor's Decree No. 70 and issued the "Interim Measures for the Collection and Management of *Cordyceps sinensis* Resources in Tibet Autonomous Region". The Department of Agriculture and Pastoralism of the Tibet Autonomous Region was made responsible for managing the region's *Cordyceps sinensis* resources. The TAR government in 2009 adopted the "Interim Measures for Exchange and Trade of *Cordyceps sinensis* Resources in Tibet Autonomous Region" (Government Order 90 of the TAR). The Department of Agriculture and Pastoralism has been authorized to issue licenses for collecting and trading *Cordyceps sinensis* and to set up regulations for resource management. The local government has also strengthened the management of resources by developing appropriate policies. It sets a standard fee for resource management and issues collection permits. During the peak season of excavation, it sends officers to the excavation points to regulate the number of collectors and make sure that no people from outside the county or without a permit enter the sites. Currently, the government is implementing the "zero distance" management model, in which there should be service teams or working groups from the government present wherever people are engaged in collection. These measures have provided the necessary institutional guarantees for the collection of . In 2008, when we were doing some field research in Qamdo, we found working groups in each of the collection points that had been deputised by the prefecture, county or township government. The focus of their work was to examine the collection permits, maintain order and make sure that no unauthorised individuals from outside the county or without a permit entered the collection sites.

5 Problems in Resource Development

While the development of *Cordyceps sinensis* resources has brought economic benefits to the people, it has also created many social and environmental problems. The problems are mainly as follows:

5.1 Disorderly harvesting

We have pointed out that relevant regulations have been established by the government of the Tibet Autonomous Region. Law enforcement has been strengthened during the collection period, and officers have been sent to excavation points to check collection permits, control collector traffic and make sure that outsiders and unauthorized personnel are kept out of the territory. However, in the issuance of collection permits for *Cordyceps sinensis*, the requirements for qualification are still too low. As long as a collector pays a management fee, a collection permit can be obtained. There are no limitations on the number of collectors or the times of collection. There have been no environmental education or awareness campaigns on the sustainable use of resources. The harvesting process of this valuable medicinal mushroom is indeed barbaric, with no mushroom left behind by the collectors. There has been no planning for the collection process, either. Collectors swarm to the harvesting sites in search for their treasure, creating fierce competition amongst themselves. No one spares any *Cordyceps sinensis* as seed material for the next year or considers the issue of sustainability. The pillage often causes serious damage to following year's output, threatening the sustainable use of such a scarce resource. One village head from Jiangda Town, Kamptot Jiangda County compared the present situation to former times. He said that in 1988, one collector could harvest more than 800 medicinal mushrooms per day, while in 2007, the most he could harvest was 60 or so per day. As market demand for *Cordyceps sinensis* increases year by year, the predatory collection practice is likely to cross a threshold. The vicious cycle will result in decreasing harvests. Without effective and immediate measures taken this important source of income for mountain farmers and pastoralists will be destroyed in one generation.

5.2 Lack of regulation of the *Cordyceps sinensis* market

There are many lawbreakers driven by the excessive profits available who use *Cordyceps liangshanensis*, *Cordyceps branches*, *Stachys geobombycis*, *Cordyceps militaris* or *Cordyceps hawkesii gray* to fake *Cordyceps sinensis*. What is worse is that customers can even find fake so-called *Cordyceps sinensis* in the market made from wheat flour, corn flour and plaster. These counterfeits are seriously disturbing the market. The government departments concerned should take effective measures as soon as possible to create a good market environment for this precious natural resource from the Tibetan Plateau.

5.3 Social problems caused by exploitation of the *Cordyceps sinensis* resources

While bringing benefits to the people, *Cordyceps sinensis* has caused a number of economic, social and environmental issues. In the past decade *Cordyceps sinensis* has brought local farmers and pastoralists considerable income, on one hand, but on the other hand, it has dealt a serious blow to other traditional industries, resulting in over-reliance on the caterpillar fungus industry. Farmers and pastoralists have deviated their interests and activities from animal husbandry and farming. If the *Cordyceps* harvest someday becomes problematic, there will surely be social and economic chaos. In addition, disputes over rangeland borders and collection rights have caused more and more social problems as well.

6 Recommendations

- **We should help farmers and herdsmen seek alternative income sources**

Cordyceps collection is totally dependent on the natural environment. Therefore, it is a high-risk and resource-based industry. Unlike other resource-based industries, such as mining and forestry, it is entirely dependent on natural climatic conditions. Therefore, in the wake of global climate change, its yield is likely to be extremely unstable. Moreover, in recent years, wild fluctuations in market prices of *Cordyceps sinensis* indicate speculation. In order to maintain social stability the primary task of the local government should be to help pastoralists develop alternative sources of income.

- **We should strengthen environmental training and improve people's awareness of conservation and the sustainable use of resources**

Cordyceps sinensis has created tremendous wealth for Tibetan farmers and herdsmen. However, it has also brought many environmental and ecological problems. In order to achieve the sustainable use of this precious resource, we must strengthen environmental education for all of the stakeholders and raise people's awareness of the sustainable use of resources. At the same time, we should take some practical measures to protect the ecological environment of the *Cordyceps sinensis*. For instance, there should be a strict limit on the times of collection, with the collection permit specifying the valid time period for collection. There should be more planning within the *Cordyceps sinensis* growing areas. We should establish some protected areas for *Cordyceps sinensis*, where natural resources can recover and where rebalance can be achieved. Measures should be taken to develop a reasonable plan of balanced protection and exploitation.

- **We should adjust school holidays so that they are aligned with the harvest season of *Cordyceps sinensis***

Classes of the primary and secondary schools are often interrupted by the harvest of *Cordyceps sinensis*. Parents take their children with them to the mountains to collect *Cordyceps sinensis*. While this is understandable, we should think about making changes so that neither the children's schooling nor the harvest suffers. The streamlining of schedules is required. Tibetan schools could build on the experiences of their counterparts in other rural parts of China where they have adjusted the holidays so that primary and secondary school pupils can support their families during the harvest. It would certainly be welcomed by the local people. It would also solve the problem of high absenteeism among students during the peak collection time.

- **We should change our mindset and strengthen research efforts that look at *Cordyceps sinensis***

As we all know, *Cordyceps sinensis* has become an important source of income for Tibetan farmers and herdsman and created more economic benefits than the other traditional industries. However, research funding for this field is far lower than that for the other traditional industries.

The relevant government departments need to change their mindset in order to catch up with the pace of socio-economic development. The relevant government departments should include the caterpillar fungus industry as a pillar industry in local planning, develop relevant policies and regulations and clear up the institutional constraints to ensure the sustainable and smooth development of this emerging industry.

In 2007, the Department of Science and Technology of the TAR launched a project to research and demonstrate key technologies for the sustainable use of *Cordyceps sinensis* resources. After more than three years of study, we have made some achievements in understanding the ecology of *Cordyceps sinensis*, its infection pathway, the active power of fungi *Hirsutella* and the breeding of *Hepialus* insects, as well as the caterpillar fungus breeding technology. We have also made progress in setting up a quality evaluation system. All of this has laid a good foundation for further in-depth studies in the future.

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4.3 Production and Marketing of Livestock Products in the Hindu Kush-Karakoram-Himalaya

Inam-ur-Rahim²⁶ and Ghulam Amin Beg²⁷

Abstract

The pastoral products in the Hindukush-Karakoram-Himalaya regions of Northern Pakistan can be divided into livestock and non-livestock origin. There is no organized live animals market in Gilgit, Baltistan and Chitral and most of the small ruminants particularly goats are consumed intensively in celebratory and sorrowful occasions, occasionally butchered or find their ways to be sold through different intermediaries in livestock markets in down country Pakistan. Cows are however commonly butchered and marketed locally and even culled buffaloes and cattle are brought from down the valleys for slaughter to the urban centres and market places such as Gilgit, Skardu, Chilas and Chitral. Among the livestock products those from milk and wool are specially valued. The butter oil (*desi ghee*, traditional clarified butter) is a sign of prestige and thus has special occasional usage, while cheese and dried whey (*qurut*) are for common domestic utility during winter. For *desi ghee* a small intensive market has also evolved in the growing towns, in particular where many households are now involved in off-farm occupation serving as the buyers. Woollen handicrafts on the other hand, has created a sizable market in Chitral and Gilgit, where the people in specific valleys keep indigenous fine wool sheep breed and use the wool of different age groups and different parts of the body is for producing different quality crafts for domestic utility and market down the country and abroad. The production of different woollen crafts also follows a particular family labour use pattern. Organizations like Aga Khan Rural Support Programme (AKRSP) and Programme for Mountain Areas Conservation (PMAC) are involved in improving the wool processing tools, processing techniques and marketing of woollen products. The PMAC is developing a wool processing unit in Garam Chashma (Chitral) as community enterprise that will further contribute to the improvement of the quality of woollen products. Goat hair is also used for preparing rugs for domestic utility especially by pastoralists. In the past skins were processed locally at the village

26 Senior Researcher University of Central Asia, NCCR (North-South) Central Asia and Landless Pastoralists Research Project Northern Pakistan

27 Programme Manager, Policy Dialogue and Partnership, Aga Khan Rural Support Programme Gilgit

level for making different homestead use products, however, with the changes in the living style, now most of the skins find their ways to the tanneries in the central and southern Punjab. Major non-livestock pastoral products including non-timber forest products (NTFPs), mining and gems cutting and polishing and eco-tourism products. *Salajeet* (base for a tonic), *Chilghoza* (seeds of *Pinus gerardina*) and *Zera* (cumin seeds, a spice) are most common NTFPs sold in the market, while precious and semi-precious gemstones are also sold as un-processed and in cut forms. However, the production and marketing systems for NTFPs are not effectively organized, mainly constrained by issues of legal rights, management and poor investments in production and marketing infrastructure and human resources. Eco-tourism products include maintaining rangelands as landscapes for attracting tourism and protection of wild animals and introduction of trophy-hunting which brings income to local communities that are invested in social development and conservation of wildlife resources.

1 Introduction

The mountainous regions of Northern Pakistan (Figure 1) are mainly arid with sparse natural forest on the hill slopes limited mainly to the southern fringes under monsoon influence. On alluvial fans at valley bottoms mainly subsistence-oriented combined mountain agriculture prevails, in which the high altitude areas are used as summer pastures. The cropped lowlands are privately owned by individual families, while the high altitude pastures are common property of the villages with differentially established rights for different communities occupying the corresponding village. The seasonality, market influence and terrain all have influence on the pastoral patterns in the mountain regions of Northern Pakistan (Photo 1). In areas with access to advanced communication systems the livestock is now sent through a jointly hired herder, while in remote valleys part of the members of each stakeholder family still visit such pastures with their own herds of livestock. The hardly accessible pastures are rented out on an annual basis to the landless pastoralists coming from down country. With different pastoral strategies the stakeholders for production and marketing patterns also vary slightly.



Source: modified version based on <http://www.pakimag.com/files/2010/05/Northern-Areas-Pakistan-Detail-map1.jpg>, accessed December 28, 2010

Figure 1: Overview map Northern Pakistan.

The families visiting the high pastures not only utilize the high pastures for livestock and their products but an array of non-livestock products as well. The pastoral products in Hindu Kush-Karakoram-Himalaya of Northern Pakistan can thus be divided into livestock and non-livestock origin. The livestock related products include live animal sold for slaughter, milk products and wool/ hair products. While the non-livestock related products include medicinal and aromatic plants, wild fruits, gemstones and ecotourism. Mining activities to extract gemstones are usually carried out at pastoral areas and it has impact on pastoral production. On one hand such activities make the pastures more vulnerable to erosion; while on the other it provide additional income to the pastoral people through direct extraction in small scale or as mining labour in large scale mining operations.



Photo 1: Shepherd returning with his flock from the summer pasture close to Panji Pass (4450 m) between Ishkoman and Yasin, Gilgit-Baltistan (photograph © Hermann Kreutzmann September 5, 1990)

According to an estimate 37% of the gross farm income in the mountains of Northern Pakistan come from livestock (AKRSP 2010). This mainly includes the cash equivalents of meat, milk, wool, and hides of the animals as well as manure contribution to the farm. The majority of these products are for homestead consumption rather than sale. The real cash income from livestock sector may be only 5–15% of the gross output in different villages. The meat consumption is still mostly limited to winter season and festivities or sorrowful occasions. Marketing of animal and livestock products is predominantly confined to villages (Ehlers and Kreutzmann 2000, Wright and Duncan 2005).

Among the non-livestock pasture products medicinal and aromatic plants are of prime importance. Though the recent advances in biotechnology have made it possible to obtain plant alkaloids in laboratories, plants are still used in compound form in traditional medicines. Pakistan is among the top eight countries of the world to export medicinal plants. The total export in year 2000 was worth USD 5.45 million with approximately more than 40% share from mountain regions of Northern Pakistan. It is expected that this value has further increased during the past decade. About 120 species of medicinal plants are collected from the mountains and exported to national and international markets. The destination of the export mainly includes Germany, Middle East,

France and India etc. Approximately 5000 poor families of mountain dwellers are engaged in the gathering of medicinal plants mainly during spring and summer (Hussain and Sher 2001).

The aim of the current paper is to reveal the importance of pastoral products marketing and their contribution to the livelihoods of mountain dwellers. The main objective is to find out the marketing patterns of pastoral products and corresponding loopholes to recommend the appropriate suggestions for improvement. In addition the development and conservation efforts underway are also highlighted.

2 Livestock-related pastoral Products and their Marketing

2.1 Livestock production and marketing

Cattle are mainly raised for milk and plough, while goats are bred for sale and meat production. Due to irregular availability of vegetables particularly in rural areas milk products and cooked wild food plants (*saag*) are the main food items available for daily homestead consumption. Surplus and ailing livestock is however, sold to the market mainly through the intermediaries. Consumption of meat and butter oil is highly seasonal and occasional in nature in the rural mountain settings of Northern Pakistan.

The livestock marketing system in the mountain region is mostly informal. The small scale retailers (*saudagar*) play the main role in the marketing system in the mountain region. The sheep and goat *saudagar* collect the saleable sheep and goat from different mountain villages and shift them to the medium and main livestock market for sale to large scale retailers (*baipari*), who only work at medium and main livestock markets. The cattle *saudagar* trades livestock at local level. Such *saudagar* exist in almost every village small town with more than 500 households. Their main role is in the cattle and milk goat trade at village or up to valley level. They also simultaneously provide cattle, buffalo and skins to local town butchers (Rahim and Viaro 2002).

2.1.1 Municipal livestock markets

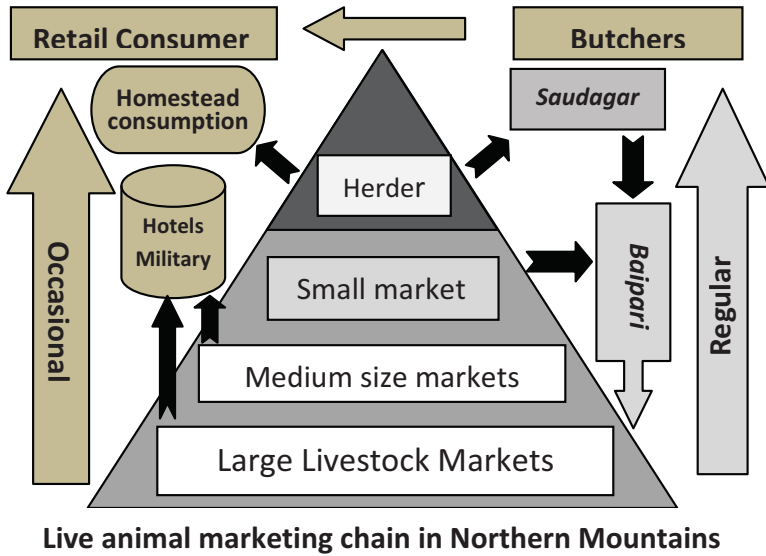
Municipal livestock markets serve as the collection points of saleable sheep and goat and supply points of cattle and buffaloes (Figure 2). The sheep and goat are supplied to the urban markets in the plains down the country, while the cattle and buffaloes are brought from livestock markets of the plain areas down the country for supply to the mountain towns markets for slaughter. For example in Gilgit, Chilas, Skardu, Gakuch and Chitral towns estimated

50–200 culled buffalos are slaughtered daily. As shown in the map, different categories of weekly municipal livestock markets exist at the southern fringes of Hindukush-Karakoram-Himalaya (HKH) in Hazara and Malakand regions of Khyber Pukhtunkhwa that deal partly with the transhumant livestock mountains.

The municipality of local towns auctions the livestock market to a contractor in open bidding on an annual basis. The contractor in turn is authorized to collect entry fee from the livestock sellers and sale fee and purchasers. There also exist an array of camp shops in the main livestock markets for sale of various farmers' household commodities such as textiles, readymade garments and second hand clothes and shoes, salt, molasses (*gurbh*) and concentrates for livestock etc. The livestock markets hence serve as one of the main channels through which the capital accumulated from the mountains environment is transferred for circulation in the local urban market.

The three big livestock markets of Barha, Nowshera and Taxila have a weekly average turnover of 15–20 thousands sheep/goats are auctioned during 2010 for 30–35 million rupees each. The three medium sized markets of Dargai, Mingora and Mansehra have an average weekly turnover of 6–8 thousands sheep/goats are auctioned during 2010 for 10–14 million rupees each. The ten small sized markets of Matta, Munda, Chakdara, Sawarhai, Shergarh, Shabqadar, Thakot, Haripur, Havelian and Balakot have a weekly turnover of 500–3000 sheep/goat are auctioned during 2010 for 1.5–5.0 million rupees each. While the other small market functions regularly, the Balakot market only function during the month of October and November and is specific for the sale of transhumant sheep and goat. According to the information provided by the relevant *Saudagars* on average 1200–1500 sheep and goat brought from Gilgit/Baltistan are traded through the Thakot livestock market and 300–500 sheep and goat through Mansehra livestock market on weekly basis.

The money collected through the auction of livestock market is spent on providing the municipal services. No money is spent on improving the market infrastructure. Even the basic services like loading/unloading, watering and shade are only provided in Taxila markets. The government regulates the prices for meat and mutton. However the animals are never sold on quality and weight basis in the livestock market. The livestock traders purchase any animal on per head/flock bargain basis.



Live animal marketing chain in Northern Mountains

Source: design by authors

Figure 2: Live animal marketing chain in Northern Mountains

Seasonality significantly affects the livestock market, and during various seasons the number, main production areas, demand and prices of different livestock species vary tremendously. The livestock markets are filled with livestock during the autumn and livestock is sold at much cheaper prices. The main reason is that the livestock owners on one side need to remove their extra livestock units to decrease the feed burden during winter fodder scarcity and to get some cash for storing food for their own families and feed for livestock to pass through the winter scarcity period.

Eid-ul-Azha serves as the main occasion of the year, when the live animal marketing is at bloom. Being the main livestock slaughtering festival, the occasional livestock markets starts in almost every town on daily basis two weeks before the *Eid* day. The subsistence farmers, the herders and *saudagar* all remain active in livestock marketing on this occasion. The total turnover on this occasion may be 25 percent of the total annual turnover of livestock trade.

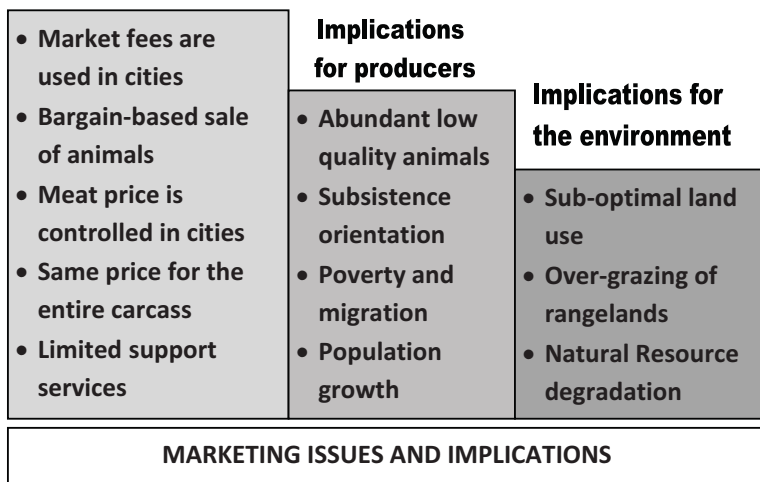
In remote mountain valleys a large number of sheep and goat are slaughtered on the occasion of other festivities like *Jashn-e-Nowrooz*, festivals related to returning animals from pastures to villages (*kuch*), funeral occasions and wedding ceremonies. Such festivities are mostly arranged during autumn to be

complementary to the surplus availability of livestock. In the *Kalasha* valleys in Chitral goat is considered sacred and large numbers of goat are slaughtered during three main religious festivals (Cacopardo and Cacopardo 2001). On the death of a *Kalasha* person up to 40 goats are slaughtered and all the *Kalasha* from the surrounding valleys are invited.

2.1.2 Current live animal marketing issues and development interventions

In the remote mountain towns transportation, processing and marketing are the missing links in a typical value chain, while the production is also constrained by many challenges (Figure 3). Despite the sizeable livestock population in Gilgit-Baltistan and Chitral (2.4 million heads), local markets usually face short supply of animals for meat purpose. The irregular supply of local animals compels local traders to substitute it with buffaloes brought for slaughter from the plains of Pakistan. Major bottlenecks include, covering long distances walking on foot from remote mountain villages, taking many nights stay on the way before reaching major markets, non-availability of shelter and feeding facilities on the way to major markets, non-availability of guaranteed market and high risk due to price fluctuation, lack of human resource to carry their animals, huge transportation cost and non-availability of suitable vehicles for transportation.

Market biases



Source: design by authors

Figure 3: Marketing issues and implications

The main interventions by government and those facilitated by the AKRSP and livestock development projects are in breed improvement and livestock health improvement. Extension workers are trained in vaccination and emergency livestock health management. The breed improvement intervention are rather negative with ambitions to change the native breed highly resistant to diseases and adoptable to steep terrain grazing with heavy breeds more suitable to intensive rearing. Other strategies through livestock and dairy development projects are accelerated development of and investments in dairy, meat, poultry and allied livestock sectors, identify bottlenecks in the development of livestock, dairy and proposing remedial producer-owned and controlled organizations and farming groups, capacity development of stakeholders and development and dissemination of appropriate technologies (Beg 2010). No intervention has been done in live animal marketing which is highly biased to favour urban consumers.

2.2 Livestock products marketing

2.2.1 Milk and milk products

The milk and milk products are mainly for household use and are only marketed in sizable mountain towns like Gilgit, Chitral, and Skardu. The mainly non-farming service and trade-oriented households are the main purchasers and the livestock-oriented rural households in the periphery of the main town as main sellers. The tradition of local milk trade in these towns is rapidly fading away mainly because of packed milk availability everywhere and lack of quality control and adulteration in locally sold milk.

The main saleable milk product is butter oil (*maska*). Butter oil extracted from milk is equivalent to sale of fresh milk or may fetch higher prices than the milk sold fresh. Butter oil is traditionally produced at summer pastures and brought down for consumption during winter. The quantity of butter oil produced by a family is a traditional indicator of wealth and status. In many mountain areas the surplus butter oil is buried in clay parts underground and is brought out during particular celebratory occasions like weddings. The older the butter oil the more it is considered valuable. Twenty five years ago, it was normal to find 60 years-old buried butter oil (*talkh rughun*), however, now with population growth the tradition of burying the butter oil is fading away. Cheese (*paneer*) and dehydrated whey (*qurut*) (Photo 2) are the other commodities produced at high pastures during summer but mainly utilized at homesteads during winter (cf. Kreutzmann 2005). These products are however for domestic use and not

for celebratory and sorrowful occasions. Butter oil is also sold within the village and to nearby towns. The main purchasers are the non-farming households.



Photo 2: Dehydrated whey (qurut) is dried out of reach for livestock. It is widely appreciated as a traditional product for storage and trade (photograph © Hermann Kreutzmann July 8, 1990)

The fresh milk, yogurt and whey are the common milk products for daily utility in the mountains. A large proportion of fresh milk is utilized in tea-making. There is no tradition of converting milk into cream. The milk for converting into butter oil is fermented using the goat skin.

2.2.2 Current milk products marketing issues and development interventions

The improvement in production of milk and improving the processing of products particularly the cheese and cream and promoting their marketing as organic mountain milk products can provide additional incentive to the pastoral communities to improve the output of milk. Increasing demand in the market can make the labour and capital investment of the pastoralists in the sector more attractive. Currently no organization is facilitating the production of quality milk products and marketing, hence pastoralists prefer to follow the least input and optimal output strategy oriented toward subsistence. The effort to improve livestock management seems not to be so much successful.

2.2.3 Wool and hair

Goat hair is mainly used in rope-making and rug-making for domestic use. Woollen handicrafts are traditionally produced for marketing in Gilgit-Baltistan and Chitral since long. Wearing local woollen caps is a tradition followed by almost every local inhabitant irrespective of status. These products are not only locally used, but are also famous in the surrounding regions and are regarded as distinguishing feature at national level.

The raw wool grading is generally based on the part of the body of the sheep from which the fleece is obtained. The best quality wool is obtained from a lamb which is used for sweater, socks, gloves, muffler etc. for marketing and makes about 10% of the total wool production. The fleece obtained from the back and neck of the adult sheep is mostly graded medium for *patti/pattu* making for marketing and that makes about 80% of the total wool production. The remaining 10% of the total fleece is obtained from other parts, limbs, belly etc, graded as poor quality, and is used for carpets, foot-wears, blankets etc at the domestic level. Wool can naturally be white and grey; however, it is also traditionally coloured brown through the use of walnut barks. As the commercial production of local woollen handicrafts was practiced since long, hence many organizations intervened to improve the quality and marketing. During the course of time certain valleys were advantageous over the other mainly because of the fineness of available wool and the special technique the artisan for its transform into woollen cloth. One of such valleys famous for its woollen products nationally and internationally is Garam Chashma (Lutkoh) in Lower Chitral.

2.2.4 The local sheep breed and quality of wool

The local sheep is a non-descript breed known as *kari* sheep that can gestate thrice a year. The wool fibre produced on the body of *kari* sheep is one of the finest at the national level and matches the Australian Merino in quality-parameters. *Kari* is one of the smallest sheep breed and the adult male may weigh up to 18 kg and adult female up to 15 kg. In spite of the emphasis on wool production additional quality the parameters of weight gain and quality of the fibre are traditionally regarded as secondary to selection traits of the species. The breeding programme and the efficient regeneration of the animal herds is the primary consideration for selection. The breed has a high scientific value for its endemism and high breeding potential and further studies are being pursued for describing and patenting the *kari* breed under the Intellectual Property Ordinance. However, the sheep bears quite a few problems for its effects of in-breeding, mal-nutrition, mineral deficiency, infestations, ill-housing etc. All mentioned factors affect the regeneration vigour and wool quality.

Wool is sheared three times a year which reduces the fibre length affording more labour for ginning and spinning. The diameter of the fibre is less than 25 micron which is graded as fine wool. The fleece is sheared with traditional hand tools which may cause loss to the wool and is labour-intensive and takes about an hour to shear about 400 grams of the fleece. Presently a sizeable proportion of wool is wasted due to skin diseases, parasitism, mineral deficiency, mal-nutrition etc. and these compel the sheep farmer to multiple shearing. Leaving the fleece on the body of the sheep for more than 3–4 months results in shedding of the fleece and the hair is wasted in the bushes and thorns

2.2.5 The Wool Processing and cottage industry

Scouring of the raw greasy wool is not in practice, however, the sheep is washed one day before the wool-shearing and all dust, dung clumps, thorns, twigs, leaves and seed etc. of herbs/shrubs are removed. After clipping the fleece is mixed and rubbed with white sand-dust. This helps to some extent to remove the grease; however, the complete de-greasing is possible only when the fleece is washed with non-corrosive detergents in warm water. Carding of wool is also labour-consuming activity and now small carding machines have been introduced which are rented for use by individuals. Spinning, to make yarn, is a technical and labour-intensive activity and on that mostly the quality of the *patti* depends. The yarn is then converted to the coarse cloth *patti* through the hand looms.

Major product of wool is the coarse cloth generally known as *patti* or *shu* in Chitrali, weaved in hand-loom with nine to ten inches width, which is a cottage industry in Chitral. Garam Chashma is well known for its quality *patti*, commonly known as *moghakan*. Mogh is a village in Garam Chashma Tehsil on the left bank of the Lutkho River. Raw wool processing and preparation of woollen products, mainly the *patti*, has, however, quite a few labour constraints, one major of them the homespun yarn making from raw wool. The yarn quality is also coarse and has little scope for fine quality *patti* preparation. The improvement in the yarn quality would allow a larger value addition to the *patti* and its further products.

2.2.6 Current support to the wool cottage industry

Wool production is complementary to the seasonality in mountain areas. Woollen handicrafts making is the primary activity during winter, when other labour intensive farming and extensive livestock management and herding activities are no more possible. Aga Khan Rural Support Programme (AKRSP) has supported the training of women in knitting and knitting machines were

also provided in Madaghlash valley. However, the local coarse wool yarn could hardly utilize these machines for fine marketable products. The durability of the cloth is very non-competitive for the poor quality of the yarn.

2.2.7 The Shubinak (Mogh Limited)

Shubinak emerged as branch of AKRSP as non-profitable organization and then converted to a private business enterprise of the *shu* or *patti* making community, the 'Mogh Limited'. However, Shubinak is still used as trade mark, which is registered for Mogh Limited. Shubinak has also improved the hand loom for improvement of *patti* but still the wool yarn quality is the main hindrance for producing a fine and durable cloth for competitive marketing of its products. The organic nature of the woollen products in Garam Chashma is otherwise an added value to the products.

Inland and outside market links are being established by the Mogh Limited for their *patti* and its products and they claim them as organic product. Their average purchase price for one yard of *patti* is PRs 130 and their market targets are 25–30 thousand metres per annum. They are collecting the *patti* from all Garam Chashma valleys and also from Upper Chitral.

2.2.8 The Wool Crafts-women Organizations

The general observations indicate that women of all ages are dominantly involved in sheep-breeding and wool-processing activities, with considerably less activities for men. Perhaps the shearing of sheep is done by men and all other processing, picking, sorting, grading, carding, scouring, spinning and handloom *patti* making are dominantly the activities of women. The women are over-burdened with the labour intensive activities of wool processing and are considerably prone to the health hazardous effects of these activities, perhaps asthma, tuberculosis etc. To consolidate the bargaining position of the wool products, mainly *patti*, quite a few crafts-persons organizations, particularly of women, have come in existence in Garam Chashma and may be elsewhere in the district. They are also developing the *patti* through the development of skills and expertise with understanding of wool quality grading during purchase and converting it into *patti*. These organized craftswomen offer prices based on the quality grading of the raw wool and its yarn. The craftswomen organizations are competing in the market for supply of quality *patti*, including that for export, with Mogh Limited and amongst them.

2.2.9 The Community Wool Enterprise

Most of the wool crafting community is aware of the wool-grading and wool yarn quality required for crafting various wool products. The hindrance in improving the quality of wool products is the poor quality of the hand-spun wool yarn, besides the scouring and carding of the raw wool. The survey of the community awareness of the quality of the wool and wool yarn and that of the potential of wool production from sheep have shown it feasible to establish a commercial enterprise of improved wool yarn production through installation of a machine for wool scouring, carding and spinning.

The Programme for Mountain Areas Conservation has taken the initiative to mechanize the wool processing through a public private partnership enterprise. Keeping in mind the wool quality, the weather and seasonal conditions and the general lower capacity of the community base labour output, a machine of 500 kg per day wool processing was found reasonable for installation in Garam Chashma. Garam Chashma is the centre of eight subsidiary valleys each having a Valley Conservation Committee (VCC) through support from Mountain Areas Conservancy Project (MACP). The VCCs from all the eight subsidiary valleys have developed a Conservancy Management Committee (CMC) responsible for operating and managing the Wool Processing Unit (WPU). The community through CMC provided the land, the then GEF funded (MACP) erected the building and the EC funded Strengthening of Livestock Support Project (SLSP) provided the machinery during the year 2008–09. The WPU was initiated at Garam Chashma in 2005 by CMC Garam Chashma under the supervision of ex-Mountain Areas Conservancy Project (MACP, current PMAC). Very long time was taken in obtaining land for the WPU, construction of hall and due to seasonal accessibility conditions, in installing the machinery

All the physical components, technical capacity and executing plans are now in place and the WPU has started functioning during July 2010. This will be followed by the sheep management plans for all the component valleys and capacity building for value added woollen products. Fourteen thousands kilogram of wool is likely to be processed through the WPU and it will have direct and indirect impacts on women health, prosperity, education and livestock and pasture management.

3 Non-livestock pastoral Products and their Marketing

3.1 Pine nuts

The pine nuts (fruit of *Pinus gerardiana* or *chilgoza*) are produced in specific forest patches primarily in the Kalasha valleys of Chitral and Diamer district in Gilgit-Baltistan with some minor patches in Astore and Chalt-Chaprot forests in Nagar. The harvesting period is between September and October. Women and nomadic Gujurs play a major role in *chilgoza* harvesting, packing, and marketing. In the Kalasha Valleys the local residents are the collectors, while in Diamer the landless pastoralists collect *chilgoza*.

The collection of *chilgoza* nuts has long been a source of additional income for many poor families living in the area. Presently the sale price of *chilgoza* is PRs 350 per kilogramme and Afghani traders from Tribal Areas and Kohistan collect it from local markets. On an average a pastoralist or a farmer earns PRs 20,000 to 30,000 annually from its sale. Estimated 3000 households are involved in *chilgoza* collection and the annual sale turnover in Diamer district is around PRs 69 million (IUCN 2007). The growing demand is leading to careless, premature and unsustainable harvesting by cutting the branches or even whole trees or burning parts of the forests to get easier access to the cones, thus jeopardizing the future production capacity of the trees and even the survival of the species in certain areas. *Pinus gerardiana* has been listed by the World Conservation Monitoring Center as a “lower risk, near threatened” species. Loop holes in marketing, improper harvesting and processing, pre- and post-harvest losses in *chilgoza* and sustainable management of *Pinus gerardiana*, and unclear tenure are the main issue needing resolution.

3.2 Medicinal and aromatic plants

Plants are utilized as therapeutic agents since time immemorial in both organized (Ayurveda, Unani) and unorganized (folk, tribal, native) form (Girach et al. 2003). The healing properties of many herbal medicines have been recognized in many ancient cultures. Early herbalists believed that the plant part resembling any part of the human body was considered useful for the ailment of those parts and there is no part of the body without its corresponding herb, a hypothesis known as the “Doctrine of Signature” (Baquar 2001). Bhiksu Atreya, a professor of the University of Taxila and his student named Jivaka were the well-known persons with an intimate knowledge of medicinal plants (Singh et al. 2003).

In the mountain areas of Northern Pakistan different indigenous systems of medicine exist since centuries and cater the needs of nearly 70% human population and livestock (Singh et al. 2003). Through experience complementary interrelations have been evolved leading to better understanding of nature at local level and therefore, enhanced the chances of human survival in harsh mountain environments (McCorkle 1992). This “primitive” way of life is fast disappearing. The relentless exploitation during the transition from traditions to modern and subsistence to market orientation disturbed the ecological balance and adversely affected their economic life along with the resource base. The result was that slowly the mountain people lost control over their economic destiny (Singh et al. 2003). The reasons for the degrading exploitation of natural resources are however, not so simple, some rooted deeply in development patterns, rapidly increasing population, fragmentation of land-holdings and slow growth of job opportunities (Repetto and Gillis 1990), and other in lack of effective institutional mechanisms.

Cumin (zeera) is found all over Gilgit-Baltistan and Chitral, however in Rattu (upper Astore) area zeera, is much valued (Rasool 1998). The market price varies from PRs 150 to 300 per kg depending on the quality and smell. The herb is being collected by shepherds and farmers from the pastures and brought to the market for sale. Though it is categorized as minor forest produce under the provision The Forest Act 1927 (West Pakistan Amendment 1964), yet there is no restriction on its extraction and large scale extraction and export is allowed by the Forest department on payment of a royalty.

3.2.1 Support to the production and processing of Medicinal and Aromatic Plants

The first project to invest in MAP in Northern Mountains of Pakistan was the Dutch Assisted Environmental Rehabilitation Project to identify the availability of different MAPs available in the region and current practices of harvesting. The WWF and SDC financed Innovation for Poverty Reduction Project (IPRP) had main focus to improve to investigate the marketing and improve the processing of MAP to have higher returns to the mountain dwellers involved in harvesting, processing and sale of MAP. The Mountain Areas Conservancy Project mainly focused on exploring the sustainable harvest capacity at different mountain regions. Efforts were also undertaken for commercial cultivation of important Medicinal and Aromatic Plants (Table 1), but these could not be found competitive with the other commonly grown cash and staple crops in the region.

Table 1: Profit margins of medicinal plants at different level markets

Name of plant	Collector rate (PRs)	National market rate (PRs)	International market rate (PRs)
<i>Aconitum napellus</i>	120	500	3000
<i>Bergenia himalacia</i>	25	250	1500
<i>Carum carvi</i>	200	400–500	2000
<i>Carthamus tinctorius</i>	150	500	1500
<i>Dactylorhiza hatagirea</i>	–	500/ 1250	7000
<i>Ephedra gerardiana</i>	5	25	800
<i>Glycyrrhiza glabra</i>	10	30	1200
<i>Hippophae rhamnoides</i>	45	300	500
<i>Picrorhiza kurroa</i>	200	–	4500
<i>Podophyllum emodi</i>	150	400	500
<i>Saussurea lappa</i>	150	150	2500
<i>Thymus serpyllum</i>	35	150	1500
<i>Valeriana wallichii</i>	–	500	5000

Source: Hussain 2004

AKRSP estimated that 700 species are being used as medicinal/aromatic plants while in the Hindukush, Himalayas and Karakorum estimated 25,000 plant species are found out of which 10,000 are termed useful. These plants are collected and sold by local *hakim* (healers), plant collectors and dealers. Twenty such species are supplied to the national market, mainly Lahore and Karachi (Hussain 2004). The study listed fifteen commercially important medicinal plants based on the following criteria: the endemic nature of plant, high domestic as well as export demand, endangered nature and documented use in traditional system of medicines. These plants are: *Artemisia maritima*, *Aconitum napellus*, *Angelica glauca*, *Bergenia himalacia*, *Carum carvi*, *Carthamus tinctorius*, *Dactylorhiza hatagirea*, *Ephedra gerardiana*, *Glycyrrhiza glabra*, *Hippophae rhamnoides*, *Picrorhiza kurroa*, *Podophyllum emodi*, *Saussurea lappa*, *Thymus serpyllum* and *Valeriana wallichii*

The medicinal plants are collected from in the wilderness. Local traders purchase these products in crude and sell them to wholesalers or exporters in town areas, on payment of daily wage labour ranging from PRs 80 to PRs 100. They

are exported in crude form i.e. in the form of roots, bark, seeds, leaves and branches. However, there is no systematic method for medicinal plant collection in these mountain regions (Hussain 2004).

3.2.2 Issues related to Medicinal and Aromatic Plants

Some of the key issues and challenges related to medicinal and aromatic plants (MAPs) are lack of authentic and scientific data about the actual potential and status of MAPs as threatened, endangered and commercial viability, value chain analysis to find missing links and cost to price variations and actual benefits to pastoral communities, patenting and intellectual property rights and safeguarding local knowledge and rights of local people and protection of indigenous knowledge.

Conservation status of MAP is not known to draw updated red list for management and biological threshold level of different species not understood. Key plant resources available in wilderness are depleted and when farmers are mobilized for non-profitable cultivation of MAP, there is over-harvesting of species from the wild. Stable MAP business requires sustainable returns of the profit and sustainable production with limited yearly production fluctuation. Collection from wild resources always poses inconsistent production. Currently collection does not match with the productive capacity of the habitat. Species of high demand are over-harvested and low demand under-harvested. Collectors are competing for early harvesting and some time pre-fruited collection, if they will wait till the maturity, other will get the chance to harvest. They mostly uproot the plant even if only flowers or leaves are needed.

Some species are over-harvested to the extent to be declared as threatened species. These include: *Saussurea costus*, *Valeriana jatamansi*, *Polygonatum multiflorum*, *Angelica glauca*, *Podophyllum hexandrum*, *Dioscorea deltoidea*, *Asparagus adscendense*, *Geranium wallichianum*, *Viola odorata*, *Aconitum spp*; *Polygonum amplexicaule*, *Glycyrrhiza glabra*, *Ferula asafoetida*, *Morchella esculenta*, *Morchella conica*, *Ephedra gerardiana*, *Jurinea macrocephala* and *Paeonia emodi*. (Rahim 2004)

3.3 Gemstone: Mining, cutting and polishing

There is a great potential for production of gemstone and mineral products in Gilgit-Baltistan. Major deposits of corundum (ruby and sapphire) beryl (emerald and aquamarine), topaz, opal, pegmatite, mica, spinel, pyrite and sedimentary deposits of gold and alluvial deposits of ruby are reportedly found

along the riverbeds of the Indus and its tributaries in the Himalayas, Karakoram, Hindukush and Pamirs.

Major gemstone mining areas include: Chumar Bakhoor in Sumayar Nagar, Hasanabad, Doorkhan, Ganish and Ahmedabad in Hunza, Haramosh in Gilgit and Stak Nala, Shengus, Braldu and Basha and Shigar valleys in Skardu district, Baltistan region. However there are potential deposits in other areas like Ghizer district and upper Hunza (Chupursan valley) for various kinds of minerals where currently Chinese entrepreneurs are involved in exploration.

As of May 2008, the government has issued 53 mining leases and 64 exploration licenses to private parties in Gilgit-Baltistan (former Northern Areas). Out of the 64 exploration license holders, eleven have been served with show-cause notices and notices for payment of dead rent. Out of the 53 mining leases ten parties received notices to increase production, while 33 parties were served show cause notice for cancellation of mining leases (Rupani Foundation 2008). It is estimated that there is a great potential for producing gemstones and mineral specimens for many years to come, even though in some areas mining is taking place for the last 20 years, more or new deposits are being discovered today. An estimated 40,000 miners, mostly pastoral communities and farmers are currently involved in mining in the Gilgit-Baltistan. Other key challenge faced by the mineral and gemstone sector is lack of value addition and income generation opportunities at local levels, especially for women and the productive poor. In Gilgit Baltistan and Chitral there were small gems cutting and polishing centres' started recently through support from Rupani Foundation and Karakoram International University with support from Italian government. The Aga Khan Rural Support Programme (AKRSP) and Karakoram Area Development Organization (KADO) established gems cutting and polishing centres in Hunza and other districts of Gilgit-Baltistan and Chitral involving women in production during the last four years.

Major issues are community ownership rights a lack of tangible benefits to gain as private miners extract the gem and minerals and make the value addition at cutting and polishing centres in the south and/ or directly export the raw material. Due to unscientific mining the mines and pastures are over exploited and destroyed and on the other hand due to lack of proper safety measures miners suffer from various kind of skin and eye diseases. The link between rights to pasture use, and leasing out mining rights in pastures to parties from outside the mountain regions is creating dual problems; the local people lose ownership rights in their traditional pastures and mountain resources, and the government and non-local parties getting licenses destroy the pastures through over exploitation.

3.4 Eco-tourism Products

The mountain region of Karakoram Hindukush Himalaya offers unique natural landscape with rich biodiversity, five peaks higher than 8,000 m, including K2. There are four designated national parks with an overall surface of 1.6 million hectares (more than 9% of the overall area of the region (Hussain 2009)). The rangelands and pastures offer beautiful meadows, plateaus and valleys with enormous potential for nature tourism and travel that generate revenue for the government and contribute to household income of local people. Community based trophy-hunting programme initiated by the government with support from conservation and development agencies is one of the key products which serves both the conservation and development goals in mountain regions.

Some of the impacts of the trophy-hunting programme include ownership of wild resource by communities, improved livelihood options and availability of additional economic opportunities, reduced livestock, imposed ban on illegal cutting of forests and controlled grazing practices, elimination of poaching, significant increase in population of *markhor*, ibex, blue sheep and associated species positive attitude of communities towards predators and improvement provision of health and education services in the area due to investments in social sector (www.wdgb.gov.pk)

4 Conclusions

Currently sheep and goat produced in Gilgit-Baltistan and Chitral find their ways to the livestock markets through different intermediaries, who extracts surpluses due to limited facilities provided by the state for livestock marketing. The milk products are used for homestead consumption and important for food security particularly in remote mountain valleys areas. Wool and woollen handicrafts are main livestock products that can be extensively traded. The non-pastoral products like medicinal and aromatic plants, wild fruits and gemstones are important in diversifying the income for the pastoral household.

The meat and live animal markets are poorly regulated and biased to favour the consumer at the cost of the producer. Such bias is materialized, first through regulated meat prices for its cheap availability to the urban consumers. Second, there are no formal regulations in the meat market for qualitative pricing of meat for example on the basis of part of carcass sold or age of the animal. This is in turn translated in live animal marketing, where livestock is sold on per head bargain basis, rather than on quality and weight basis. This allows for the exploitation of the producer and compels him to look at the number of animals rather than the quality of animals. The increasing number of livestock

in turn impacts the pastures through over and less uniform grazing. Third, the fee extracted through livestock market is spent in town with no pay back to the livestock sector. In most of the livestock markets, even no watering, loading/unloading and shade facilities are made available. The wool processing is still through traditional ways and the introduction of mutton sheep breeds is threatening the survival of woollen handicrafts. The unsustainable harvest of medicinal and aromatics plants from wild have brought many species to the endangered list. The mining of gemstones and precious metal are providing alternative occupations, however, the absence of regulation to mitigate the negative environmental impacts are making such excavations hazardous.

Livestock and its products are the main pastoral output in HKH Mountains of Northern Pakistan and can be a vehicle to support the sustainable uplift of the communities. Reducing market biases in live animal marketing may contribute to sustainable use of pastures. The promotion of wool processing and value addition to the woollen handicrafts in some areas has promising results and need extension to other areas as well. The medicinal and aromatic need identification of thresholds for sustainable and regulated harvest from the wild is important pre-requisite to maintain biodiversity. The gemstone excavation similarly needs regulations for rehabilitating the degraded sites after excavation. The conservation of wild ungulates through communities for trophy hunting and eco-tourism are the other proven areas for diversifying income opportunities for pastoral communities and improving their livelihood.

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»»» 5 Pastoral Practices and their Transformations

5.1 Pastoral Practices on the Move – Recent Transformations in Mountain Pastoralism on the Tibetan Plateau

Hermann Kreutzmann²⁸



Photo 1: Modernisation has significantly affected pasture utilisation strategies (photograph © Hermann Kreutzmann October 23, 2010)

28 Chair of Human Geography, Director of the Centre for Development Studies and Institute of Geographic Sciences, Freie Universitaet Berlin

Abstract

The Tibetan Plateau is a huge ecological area perfectly predisposed for mountain pastoralism. Debates about pastoral practices, common property regimes and rangeland management have gained pace in recent years since the environmental challenges and economic returns have been discussed in the framework of climate and global change. Initially the remote lifestyles of Tibetan nomads in peripheral regions were highlighted on account of sustenance from their own produce and subsistence economies. Even then mountain pastoralists were embedded in a network of mutual exchange relations that enabled them to survive in remote mountain plateaux and valleys. Their command of yak-breeding, their abilities to adapt to harsh environmental conditions and to cover huge distances between extensive natural pastures and market centres brought admiration from outside observers. Their “traditional lifestyle” seemed to be the perfect adaptation to environmental conditions. Conventional thinking attributed more importance to ecological factors than to politics, economy and society. Thus, the focus was directed to local production and less to animal husbandry as one component of a mountain-based household production system. The 20th century proved to be one of socio-economic change in all regions and for all communities. The Tibetan Plateau is no exception to this. Collectivisation in the aftermath of the Chinese Revolution introduced forms of social organisation that have been modified several times since. The shift from peoples’ communes to the production responsibility system, from strict state governance and command economy to lenient forms of private ownership and entrepreneurship, from pasture laws to regulating rangeland management has introduced new concepts, policies and management tools that are significantly changing the institutional structure and organisational set-up. The challenges are environmental degradation processes triggered by social and climate change, contested commons and their boundaries, external development and modernisation strategies versus local and regional perceptions and participation demands in decision-making processes. Present-day practices are the result of adaptive mechanisms as a response to all kinds of challenges and external reforms, infrastructure development (Photo 1) and provision of subsidies. Mountain pastoral economies and societies of our time are strongly linked with neighbouring markets and interrelated socio-economic structures. This especially holds true for pastoralists of the Tibetan Plateau who are significantly embedded in government programmes and poverty alleviation strategies, and who respond to rangeland management packages and pasture laws by adapting to change. Their sources of income are highly diversified and draw on animal husbandry and agriculture as its basis and are augmented by government salaries, proceeds from wage labour and incomes from trade

and entrepreneurship. Today's mountain pastoralism is, on the one hand, a livestock-based activity and related to different localities connected through mobility. On the other hand, significant incomes are derived from other local and non-local sources, often surpassing the amount generated from pastoralism. In future, part of pastoralists' income may be derived from payment for ecological services that are provided by pastoralists as landscape managers for the maintenance of fragile environments and rewarding sustainable stocking practices. Pastoral practices reflect adaptive strategies that respond to the ecological, socio-economic and political environment over time, thus giving insights into path-dependent developments in remote mountain areas.

1 Introduction

Pastoralism is often regarded as a marginal form of spatial utilisation in deserts, steppes and mountain ranges. The Inner Asian vast tracts constitute such an area, of which China controls a major share (Figure 1). Three quarters of all rangelands are located in the semi-arid, sparsely settled areas of the north and west of the PR of China. Out of China's 400 million hectares of rangeland, 140 million are to be found in mountainous regions of the Tibetan Plateau; in addition there are 57 million hectares of natural pasture in Xinjiang. Thus both areas – in general suitable for pastoral activities – comprise about one fifth of China's land area. Close to 40 million people live in 260 predominantly pastoral counties.²⁹ The livelihoods of their less affluent citizens are strongly related to the natural resources of the rangelands. About five million pastoralists and combined mountain farmers make a living on the Tibetan Plateau by keeping twelve million yaks and thirty million sheep and goats.³⁰ In an ecological definition the Tibetan steppe covers 165 million hectares equalling more than two fifths of China's grazing areas.³¹ Pastoralists are significantly affected in their survival strategies when environmental changes and social transformations alter their resource base. In reverse, lowland communities might be significantly affected when environmental degradation endangers the expected release of water from Himalayan glaciers, when the biological diversity of plant

29 Miller 2002: 22, Tashi et al. 2010: 54–55.

30 Sheehy, Miller and Johnson 2006: 143. Out of approximately sixteen million yaks worldwide, about fifteen million are to be found in the PR of China, cf. Wiener, Han Jianlin and Long Ruijun 2003.

31 The provincial share in grazing lands of the Tibetan steppe comprises: 118.4 million hectares in the Tibetan Autonomous Region and Qinghai, 15 million hectares in the northern part of the Kun Lun Mountains of Xinjiang Uigur Autonomous Region, 14 million hectares in western Sichuan Province, 5 million hectares in northwestern Yunnan Province, and 12 million hectares in western Gansu Province (Sheehy, Miller & Johnson 2006: 143).

species is affected, and when over-exploitation of pastoral resources threatens the seasonal recovery of the vegetation cover.



Figure 1: The Tibetan Plateau – embedded into Asian mountain systems

2 Pastoral Practices – structural and spatial Considerations in Pasture Utilisation

The Tibetan Plateau resembles a classical model region for two utilisation strategies³² that are applied in optimizing access to natural pastures in high mountain areas. The Tibetan steppe is probably the largest compact area of its kind and is unique in that the areas of agricultural and pastoral activities are rather separated. The pastoral space is highly elevated and seasonally reaches up

32 Cf. Ehlers & Kreutzmann 2000. For a wider debate on classifications and interpretation of nomadism and pastoralism cf. Barfield 1993, Benson & Svanberg 1998, Davies and Hatfield 2008, Ekvall 1968, Goldstein & Beall 1991, 2002, Humphrey & Sneath 1999, Khazanov 1994, 2005, Khazanov & Wink 2001, Manderscheid 2001, Miller 2008, Salzman 2004, Schlee 2005, Scholz 2008.

to 4500–5300 m in altitudes where crop-farming is out of the question.³³ Oasis and pasture settlements are quite distinct features of the cultural landscape.

The first utilisation strategy is combined mountain agriculture that finds here some of the highest locations for mountain oases anywhere in the world. On average altitudes range between 3300–4400 m for the permanent habitations from where shepherds leave with their flocks for higher elevations where natural grazing is seasonally utilised during summers. The settlement space is concentrated in river oases that represent the lowest elevations available for agricultural practices.



Photo 2: Combined mountain agriculture in the Yarlong Valley
(photograph © Hermann Kreutzmann September 12, 2000)

Combined mountain agriculture (Figure 2) has the advantage of simultaneous fodder production in the permanent homesteads for herds that are grazed in the high-altitude pastures during summers (Photo 2). The limiting factor in the annual cycle is the provision of feed for up to nine months when high pastures are not accessed. The additional fodder has to be produced on private or common property village lands. Farmers' habitations are the centre of activities from which the fodder resources are managed. While the natural grazing provides fodder for just a quarter of a year, storage has to be organised from crop residues

33 Vegetation periods are too short to allow the cultivation of any grain crops.

and from additional fodder crops. Storage of harvested hay and grass may augment the fodder capacity. Access to the pastures involves shorter migrations.

Mountain oases where combined mountain agriculture is practised occupy a rather limited space in Tibet and are mainly to be found in the western Tibetan river valleys of the Yarlong-Tsangpo valley and its tributaries (up to 4400 m), the Qaidam Basin in the north and in the eastern lower valleys (down to 3300 m). Classical crops comprise barley, wheat, peas, rapeseed and potatoes. Less than one percent of the Tibetan steppe is cultivated.³⁴ Consequently, in contrast to other mountain regions of High Asia³⁵ combined mountain agriculture plays a secondary role in the utilisation of natural grazing on the Tibetan Plateau. The overall majority is utilised in different ways and spatially quite distinct. Hypsometry or orography as well as temperature variation between crop-related vegetation periods and residual surviving pastures have kept contested commons between farmers and pastoralists significantly apart.³⁶

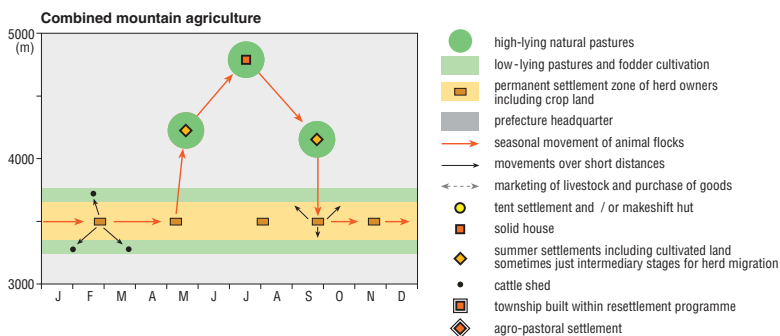


Figure 2: Combined mountain agriculture

Nomadism – the classical predominant utilisation strategy – incorporates the advantage of greater mobility covering huge distances and driving the herds to the upper limits of survival. At least over long periods of time, nomadic groups were able to exploit natural resources at dispersed locations. Great distances in the order of several hundreds of kilometres separated economically valuable mountain

34 Sheehy, Miller & Johnson 2006: 143.

35 In the Hindukush, Karakoram, Pamir and certain parts of southern elevations of the Himalaya combined mountain agriculture plays a much more significant role, cf. Kreuzmann 2005, 2009.

36 Miller (2008: 3): “Tibetan nomadic pastoralism flourished because there was little encroachment into the nomadic areas by farmers trying to plow up the rangeland and plant crops. In addition, the livestock production practices developed by nomads were a successful evolutionary adaptation to life in one of the most inhospitable places on earth.” Cf. Sheehy, Miller & Johnson (2006: 147).

pastures in summer from winter camp sites with areas of less economic interest lying in between. Sometimes spring and/or autumn pastures were frequented when suitable forage was accessible.

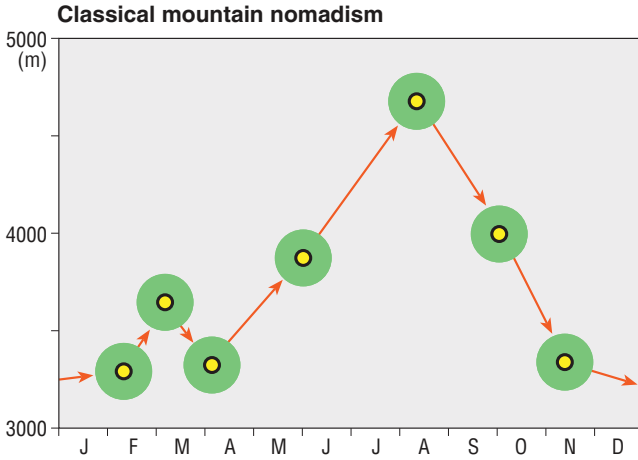


Figure 3: Classical mountain nomadism

Projected on the Tibetan Plateau, “classical mountain nomadism” (Figure 3) with functional migration cycles can be established in a historical context: longer stays in high-altitude pastures during summer alternate with winter grazing in low-lying basins in the northern foothills or on the plateaux within the Tibetan steppe.

In both areas the nomads are dependent on being tolerated as a mobile group – this general feature is of less concern here as the regions of contest are spatially quite distinct – and being able to pay the grazing fees if applicable. Their self-image of the *brog’pa*³⁷ is strongly linked to their specialisation in animal husbandry (Photo 3) and command of techniques that are missing in other

37 Gruschke (2008: 14): “The *’brog pa*’s self-image, as Goldstein and Beall [1990: 64] have noted, is primarily built on being pastoralists in marked contrast to the people practicing farming. Their self-conception does not correspond to our western notion in which moving herds or living in tents “belongs” to their concept of being nomads – the term that is generally used as the English translation of *’brog pa*. Yet, animal husbandry has to be the main determinant of their production activities and mobility, and thus determines what they understand as a way of life. This way of life is actually practiced, and it does not merely function as a value orientation. In addition to raising livestock, many other activities, such as trading, hunting, gathering and farming may also be practiced without definitely changing the pastoralists’ self-image as *’brog pa*, ...” Cf. Miller 2008.

groups engaged in agriculture. For the Tibetan Plateau yak-keeping is such an activity that is strongly related to the *brog'pa* who are the experts in a region where the vast majority of all yaks are bred and raised, and where the yak has been the object of significant research over long periods.³⁸



Photo 3: Specialised pastoralists manage to utilise high pastures in the Karo La region (5010 m)
(photograph © Hermann Kreutzmann August 2, 1998)

A third utilisation strategy – designated as detached mountain pastoralism (Figure 4) – is a more recent strategy reflecting societal transformations, collectivisation and forced sedentarisation resulting in permanent settlement in high-altitude grazing grounds. Basically, long-distance migrations ceased to exist and were replaced by short-distance migrations at a rather high altitude of permanent abodes, usually above 3000–4000 m.

38 Cf. Wiener, Han Jianlin, and Long Ruijun 2003. “Tibetans place so much value on it that the Tibetan term for yak, *nor*, can be translated as ‘wealth’” (Miller 2008: 8).

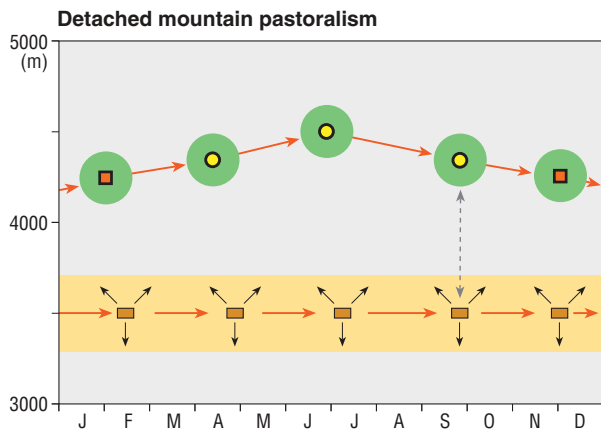


Figure 4: Detached mountain pastoralism

Livestock products are exported from the high pastures and exchanged in market towns and cities for all kinds of necessities needed for life on the Tibetan Plateau. Clarified butter, meat, wool, felts, hides and hair are among the dominant products that are exchanged in animal husbandry. The previous market access was replaced by a strictly regulated system of delivery and receipt. Pastoral products were delivered to administrative headquarters that further processed and distributed the goods. In exchange, pastoral communities were supplied with all items at more highly subsidised rates than were available to all other citizens. Collectivisation was regarded as a means to bring the same amenities to the mountain dwellers in remote locations as were available to members of collective farms and peoples' communes in other rural areas. The command economy regulated all kinds of exchange, tributes and subsidies. Permanent settlements restricted the flexibility of movement and the potential for adaptation, while at the same time infrastructure assets were brought to focal habitations that functioned as central places in remote locations.

In recent years two new forms of organising pastoralists have been tested and implemented that can be regarded as a further step in “developing” and “modernising” peripheral communities. Under the heading of “resettlement” two approaches are followed: (i) Resettlement in high pastures (Figure 5). In furthering the modernisation attempts of previous interventions in pastoral communities, schemes have been designed that bring features of urbanisation to pastures and their inhabitants.

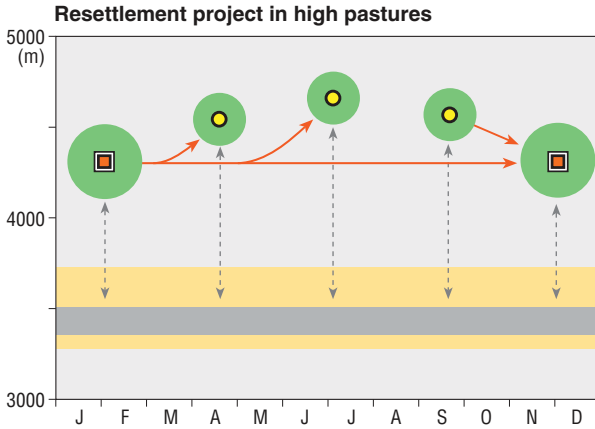


Figure 5: Resettlement in high pastures

A concentration of pastoralists' habitations in newly built townships envisages economies of scale in terms of infrastructure provision, health and educational institutions, agricultural extension services, marketing of livestock products and supply of basic goods. A strong relationship between the pastoral counties and their newly built townships, on the one hand, and the cities functioning as prefecture seats, on the other, is the basis for a modern network of communication and exchange. The idea is well in tune with conventional regional planning inspired by modernisation theories, thus creating a web of settlements that is integrated into a system of central places at higher levels. For the Tibetan Plateau and adjacent high mountain regions such an approach results in township development in remote locations and in enormous investment in infrastructure development on the basis of external subsidies.

(ii) Agro-pastoral resettlement schemes (Figure 6) in lowland regions. The second approach of recent times is inspired by the notion that development does not take place in remote mountain areas. Consequently, mountain dwellers are resettled in lowland regions close to urban areas where infrastructure is available and easily accessed. The price is relocation of pastoralists far from their summer pastures close to the consumer markets. The greater distances need to be covered by additional support for herd migration or rather herd transport on trucks to their summer pastures.

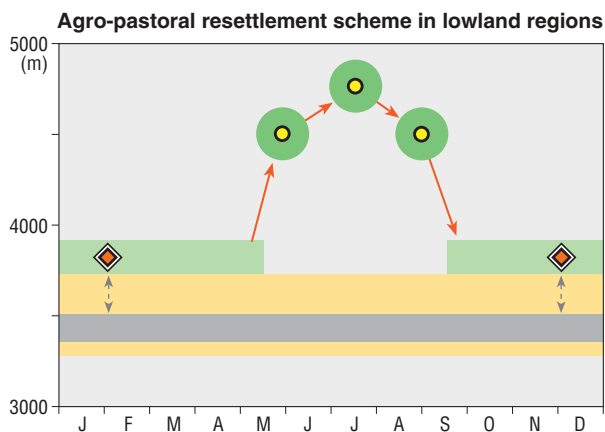


Figure 6: Agro pastoral resettlement

Agro-pastoral resettlement is envisaged for those mountain areas that are located at the fringes of the Tibetan Plateau or that are close to low-lying areas where distances are manageable. For vast tracts of the Tibetan Plateau these distances to be covered are significant and therefore less feasible.³⁹

All approaches can result in competing for natural resources in the same location and have frequently been discussed from that perspective. The ecological aspect has been expanded to the debate about conflicting economic strategies. Sometimes the political dimension of power and influence, grazing taxes and the levying of them, threat and security is neglected in the historical context. In recent times we have to concentrate on the challenges between external planners and local user groups, between perceptions of modernity and preferences of lifestyles, between subsidised interventions and stakeholder participation.

In the classical discourse of modernisation and social change, nomadism's place is usurped by agriculture. In the context of development in stages, the sequential order of nomadism prior to crop farming is highlighted, although historical evidence always points to the co-existence of both. Modernisation theory made it a vital argument to perceive progress as a transition from mo-

39 In Xinjiang Uigur Autonomous Region examples exist that are termed agro-pastoral resettlement schemes, e.g. in Aqto County close to Kashgar. In fact, these new schemes come close to migration cycles of olden times when the Kashgar oasis was the winter abode of choice for Pamirian pastoralists. The present scheme is embedded in a quite different socio-political context and deals with subsidies and support from the central state authorities.

ble economies to settled farming and entrepreneurship. The co-existence of both in Central Asian mountain regions and on the Tibetan Plateau reflects the complementarities and interdependence: nomadism/pastoralism is not feasible without exchange relations with farmers and markets. Nevertheless, the altitudinal limits of habitations and the utilisation of marginal lands have significantly shifted towards high-altitude and arid areas. The extensive utilisation of marginal resources has been superseded by intensification and increasing external inputs. Thus, it is not surprising that mountain farmers and pastoralists have been a prime target for “development”, which aims to reduce subsistence levels by integrating people from the periphery into the mainstream of nation states, thus endangering choice and transforming “traditional” lifestyles and locally developed economic strategies. Presently, the modernisation debate has opened up new avenues: Environmental protection, the security of water sources, biological diversity, nature protection and attempts to reduce overgrazing and environmental degradation are taken as strong arguments for interfering in “traditional” pastoral activities.⁴⁰ Thus, modernisation theory is applied in an environmentally-grounded framework that promises sustainable development if change is brought about. The essential understanding of modernisation-theory-inspired approaches is nevertheless taken from its very core: Development is supposed to take place in urban settings; if rural communities are to be integrated into mainstream society development, then two paths are clearly visible and appear to be the outcome of planners’ logic: bringing townships to the mountains or moving mountain dwellers and pastoralists to the low-lying urban centres.

The two recently developed resettlement strategies show that in the 21st century a renewed interest in pastoral areas has challenged regional planners and policy-makers. As mentioned above, environmental and socio-economic considerations form the background for huge investments that aim to reduce the social gap between urban and rural communities, between city-dwellers and pastoralists, and that are in tune with global and social change.

40 “... about a third of the rangelands on the Qinghai-Tibetan Plateau are currently considered moderately to severely degraded. In the Tibetan Autonomous Region, the percentage of degraded rangelands increased from 18 to 30% of total area between 1980 and 1990. Degradation is also a growing concern in Naqu Prefecture where degraded land makes up to 40% of the total degraded rangeland in the entire Tibetan Autonomous Region. Some *Kobresia*-dominated communities in alpine meadows of the Tibetan steppe have deteriorated to such a degree that most of the sedges and associated grasses have disappeared, leaving annual plant species and bare soil termed “black beach”. Overgrazing and burrowing by pikas (*Ochotona* spp.) have been implicated as major causal factors of this degradation, although climate change and increasing aridity may also play a role. This degradation calls into question the long-term sustainability of the Tibetan steppe under current use” (Sheehy, Miller & Johnson 2006: 143).

The renaissance of modernisation theory – or one could argue that it never ceased to inspire mainstream development policy and strategy – poses a number of challenges and creates curiosity about path-dependent development in remote mountain regions in general and in the pastoral sector of the Tibetan steppe in particular. How did previous experiences influence the creation and design of new approaches and concepts for the transformation of pastoral communities and their practices in resource utilisation and animal husbandry? The experiences of post-revolutionary China can support and enhance our understanding of the future prospects.

3 Transformation of pastoral Practices in China

One of the great promises of all revolutions that took place during the 20th century was the vision of better life for rural populations.⁴¹ The Chinese Revolution was no exception to this rule. Within one decade of its accomplishment major interventions in the rural sector took place in a three-step approach (Figure 7). First, mutual-aid teams were formed to enhance cooperation between farmers in the villages. The second step intervened in agricultural production by applying economies of scale and borrowing from experiences in the formation of cooperative societies. Agricultural production cooperatives preceded the major intervention in the rural areas. Within the so-called “democratic reforms” and the “great leap forward” a new structure was implemented that built on collectivisation and the introduction of peoples’ communes (Table 1).

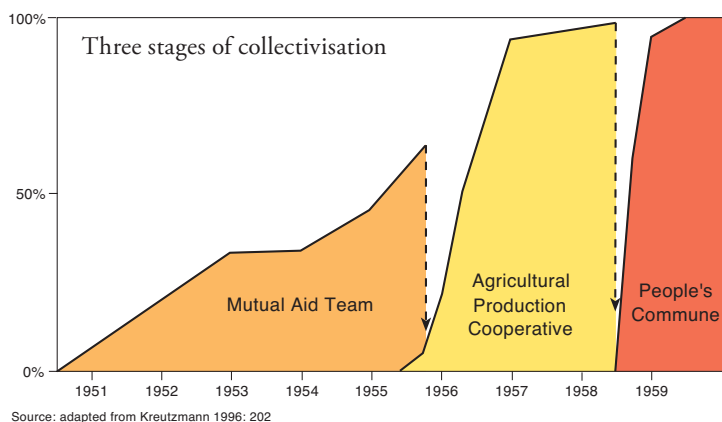


Figure 7: Three stages of collectivisation

41 Eric Wolf has analysed these revolutions regarding promise and effect, cf. Wolf 1968.

For the pastoralism sector the collective ownership of livestock and the introduction of permanent winter settlements were among the key features and visible signs of a changing pattern of social organisation. The formation of collective work teams and production brigades influences the division of labour and the specialisation within animal husbandry practices. With these reforms a slogan came up that was repeated and kept alive for nearly two decades: “take grain as a key link” (*yi liang wei gang*) which during the cultural revolution (1966–1976) – the subsequent major intervention phase – resulted in a “grain first” policy. Repeatedly, analysts have interpreted these interventions as a strategy to expand crop farming at all costs and at the cost of reducing animal husbandry. Peter Ho has questioned this interpretation and warned against taking it as a reduction strategy: “From the very beginning the full slogan ran: ‘Take grain as the key link for overall development and diversification’ (*yi liang wei gang, quanmian fazhan, duozhong jingying*). This slogan was accompanied by another: ‘Agriculture, forestry, and animal husbandry are interdependent; not one can be omitted’ (*nong, lin, mu san zhe huxiangyilai; queyi bu ke*)”.⁴² He emphasises the respective interventions in all sectors including animal husbandry as a strategy to enhance food security for society. Very restrictive approaches that had significant flaws and caused severe problems are mentioned here only for the purpose of their collective properties that established collective ownership of livestock and productive infrastructure. The “iron rice bowl” as a system of food security for the general public was envisaged, but productivity remained low.

42 Ho 2003: 50.

Table 1: Initial Chinese reforms affecting pastoralism on the Tibetan Plateau

Name	Period	General scope	Impact on pastoral practices
Democratic Reforms Great Leap Forward "take grain as the key link" (yi liang wei gang)	1958–1959 1958–1961	Collectivisation, introduction of peoples' communes, creation of collective work teams, production brigades etc.	Collective ownership of livestock Division of labour Directives for migration between pastures Sedentarisation of pastoralists
Cultural Revolution Grain First Policy	1966–1976	Political mobilisation that influenced all aspects of daily life and economic practices	Collective ownership of livestock and production tools Division of labour, professional specialisation
Four Modernisations "reform and opening-up" (gaige kaifang)	1978–1996 1980	Dissolution of peoples' communes in the strict sense Introduction of household responsibility system	De-collectivisation Distribution of communal livestock among households according to size Revival of "traditional" pastoral practices Contracting of grassland user rights to individual households Persistence of pastoral herding communities in places

Source: Compiled on the basis of Foggin 2008, Gruschke 2008, Ho 2000, 2001, 2003, Miller 2000, Oi 1999, Richard, Yan Zhaoli and Du Guozhen 2006, Yan Zhaoli 2005 and own observations

Significant change to rural areas and pastoral communities was brought about when after 1978 Deng Xiaopeng's "four modernisations" were implemented by "reform and opening-up" (*gaige kaifang*) strategies. The introduction of the "household responsibility system" and the dissolution of the peoples' communes

started the process of de-collectivisation. For three decades some observers have noted a revival of a “nomadic way of life”⁴³, others perceive the distribution of communal livestock among households and the contracting of grassland user rights to them as the beginning of a deregulation and privatisation in the pastoral sector.⁴⁴ For nearly two decades this strategy was the conventional approach in giving certain degrees of freedom to pastoralists.

Table 2: Recent reforms affecting pastoralism on the Tibetan Plateau

Comprehensive Set of Four Constructions – the “Four-Way Scheme” (sipeitao jianshe)	1996–2004	Infrastructure development and provision of services State-sponsored privatisation	In the Grassland Areas : (i) subsidised building of permanent settlements (jianshe dingju dian) and of shelters for livestock on winter pastures, (ii) erection of fences (jianshe weilan) to improve efficiency and to modernise/ rationalise animal husbandry, (iii) construction of schools and health stations (jianshe xuexiao weisheng zhan), (iv) contracting pastures to families (bao caoyuan dao hu)
Great Development of the West campaign (xibu da kaifa)	Since 2000	Significant support for infrastructure development and subsidies for rural uplift	Rural infrastructure

43 Manderscheid 2001.

44 Goldstein & Beall 1999, Ho, 2000, Oi 1999, Yan Zhaoli et al. 2005.

Restore Pastures to Grass (tuimu huancao) as part of "Farmland to Forest" (tuigeng huanlin) policy "Grain to Green" New Grasslands Law	2002	Poverty Alleviation through Migration (yimin fupin) schemes	Resettlement schemes involving concentrated settlements with infrastructural assets
	2003		Centralised livestock-breeding and animal husbandry-related extension and support services New division of labour: transforming pastoralists into labourers outside the region and into professionals in other trades than animal husbandry
Ecological migration (shengtai yimin)	2007–2012	Permanent relocation of (former) herding communities	Two-tier approach: environmental – to protect biodiversity and water sources, reduce overgrazing and degradation
New Tent-Dwelling Life (NTDL) project	2009–2012	Sedentarisation of pastoralists	– and development-oriented – modernisation of lifestyles and urbanisation Nearly 90% of all Tibetan pastoralists in Sichuan province are to be settled in 1409 permanent settlements in 29 counties

Source: Compiled on the basis of Banks et al. 2003, Bauer 2005, Foggin 2008, Gruschke 2008, Manderscheid 2001, Miller 2000, Richard, Yan Zhaoli and Du Guozhen 2006, Tao Lu, Wu Ning and Peng Luo 2009, Wu Ning and Yan Zhaoli 2002, Yan Zhaoli et al. 2005, Yeh 2005, and own observations

In recent years the planning vacuum seems to have been filled again. With the “Four-way scheme” (*sipeitao jianshe*) an attempt to improve infrastructure and to provide necessary public services was introduced that specifically affected living and production in the grassland areas (Table 2). Four key “constructions” were identified that aimed at significant changes in livelihood conditions: First, based on current experiences with appropriate construction techniques an attempt to introduce “modern” housing and suitable livestock shelters is implemented with significant external subsidies. Second, in order to optimise pasture utilisation, fencing of pastures (Photo 4) has been identified as an efficient tool to rationalise animal husbandry. Third, social infrastructure based on schools and health facilities is to be made available to pastoralists. Fourth, pasture user rights are contracted to pastoral households on a private ownership basis. This strategy was started prior to the turn of the millennium’s “Great Development of the West” campaign, into which the “four constructions” fitted well. Shortly afterwards a new turn and modification of planning came up that has been characteristic for the last decade and that might give directions for the future.



Photo 4: Fencing as a tool in optimizing pasture utilisation
(photograph © Hermann Kreutzmann October 18, 2010)

4 Resettlement Programmes

The above-mentioned observation that a significant share of pastures on the Tibetan Plateau and in adjacent regions such as Xinjiang are severely degraded has supported the introduction of further measures that have been justified and rationalised on ecological and economic grounds.⁴⁵ The “restore pastures to grass” (*tuimu huancao*) campaign as part of the wider framework of “farmland to forest” (*tuigeng huanlin*) is accompanied by slogans such as “grain to green” and aims at poverty reduction in a comprehensive policy approach. “Poverty alleviation through migration” (*yimin fupin*) suggests a new dynamic involving people to be moved. Resettlement schemes introduced since 2002 aim at population concentration in “resettlement in high pastures” (Photo 5) or “agro-pastoral resettlement in lowland regions” (see above). Both envisage concentrated settlements resembling townships that provide all infrastructural assets for a decent life. Animal husbandry will significantly change as fewer shepherds will be involved in schemes that concentrate livestock in central stables/shelters and that provide sophisticated livestock-specific agricultural extension and veterinary care.



Photo 5: Pastoral settlement in Naqu Prefecture
(photograph © Hermann Kreutzmann October 18, 2010)

⁴⁵ Cf. Foggin 2008, Ho 2001, Miller 2000, Sheehy, Miller & Johnson 2006, Tashi et al. 2010, Yeh 2005.

Mechanisation of operations (Photo 6) and “rationalisation” of pastoral production aims at providing a higher return from animal husbandry with less people involved. The rationalisation of livestock-breeding and pasture utilisation releases a workforce that is meant to become migrant workers and labourers in cities. During the last five years these strategies have become more specific: “ecological migration” (*shengtai yimin*) is addressing both objectives. First, environmental protection is supposed to be enhanced by out-migration of pastoralists and abandoning of previous regularly utilised pastures. The aim is to preserve biological diversity and water sources by reducing overgrazing and environmental degradation by “depopulating the Tibetan Grasslands”.⁴⁶ The second objective supports “modernisation” of lifestyles by providing urban amenities in new forms of settlements that fulfil the size requirement and are well connected to central places of higher order, thus enabling flexible approach and exchange. Sedentarisation seems to be the strategy of the hour, aimed at nearly all pastoralists of the Tibetan steppe. Little choice remains for alternative lifestyles and production strategies when resettlement is the only adaptive strategy implemented that deals with challenges of climate, global and social change.



Photo 6: Grass harvesting for winter fodder in Central Tibet
(photograph © Hermann Kreutzmann October 23, 2010)

⁴⁶ Foggin 2008.

5 Future Prospects for pastoral Practices in the Light of environmental Protection and Modernity

In Sichuan official statistics have identified that 219,000 out of 533,000 Tibetan pastoralists have no permanent settlements and that in addition 245,000 are living in “shanty houses”.⁴⁷ The “New-Tent-Dwelling Life” project envisages benefiting those 473,000 pastoralists. A significant amount of funds – about 18 billion Yuan (app. 2.6 billion USD) is allocated by Sichuan Province during 2009–2012. The authorities will “construct 1409 permanent settlements within a total area of 240,000 km² (approximately equivalent to the area of the United Kingdom) in 29 pastoral counties”.⁴⁸ Probably this new strategy is unique when it comes to the resettlement of people, the exclusion of space from human utilisation, and the consequences of this interference. Abandoning cultural landscapes does not necessarily invoke a return to nature. The succession of previously cultivated and grazed lands could be an unwelcome set of vegetation creeping in.

The question remains: Are there any alternatives for dealing with obvious degradation in certain places and with the preservation of natural and cultural landscapes? Pastoral strategies have proved over centuries that a resource can be utilised in a sustainable manner. If we are confronted with a question of scale when it comes to environmental degradation then other options could be useful tools in tackling the challenges and constraints. The payment for ecological services could be an attempt to improve the living conditions of pastoralists by leaving them where they are. Payment for ecological services involves the reduction of flocks to an acceptable herd size that allows sustainable management of pasture resources. The difference between present high stocking quotas and acceptable ones would be paid in cash to the herdsman by government authorities. This could amount to about a third of the pastoralists’ household income.⁴⁹ In view of the huge amounts of government investments that are planned to be allocated for resettlement schemes it could be a worthwhile consideration to evaluate the advantages of having pastoralists as active landscape managers instead of removing them in great style from pastures that have been utilised for centuries. The indigenous knowledge accumulated by pastoralists over many generations seems too valuable to be just neglected or omitted.⁵⁰

47 Tao Lu, Wu Ning & Peng Luo 2009.

48 Tao Lu, Wu Ning & Peng Luo 2009: 1074.

49 In a recent study Wilkes et al. (2010: 64–65) discuss the payment for environmental services and provide an example from Hongyuan where the difference in a household’s annual income would be app. 6150 Yuan, equivalent to a third of the overall income.

50 Cf. Miller (2002) who advocates the incorporation of pastoralists’ indigenous knowledge.

Leaving the ecological argument aside, the “modernisation” argument remains to be addressed. Intervention in the form of “ecological migration” seems to aim at a change in lifestyles. The welfare gap between affluent urbanites of coastal eastern China and rural populations of the interior, west, mountains and steppes has been widening. A society has to decide how to handle such a situation if the stipulated aim is to mitigate the effects of social differentiation. In affluent western societies substantial subsidies are regularly transferred as cash income to farmers and pastoralists in “disadvantaged regions”.⁵¹ The public discourse has shifted over time. Presently, the protectors of cultural landscapes represent only a very small minority, but are in a comfortable position. Winds of change might bring a different sort of appreciation. Projected on the Tibetan Plateau, the question remains whether there is only one way forward. Critics of the resettlement schemes suggest that in contrast to a top-down approach a “community-co-management”⁵² could be helpful by incorporating local stakeholders, the pastoral households as local communities, as equal partners in a joint effort to design development packages that are accepted by all. Thus, valuable indigenous knowledge that regional planners nearly always lack could be made useful for tackling a complex constellation that calls for holistic and sensitive approaches. In any case, a decision-making process based on consensus supports acceptance, participation and understanding. For the future of the pastures on the Tibetan Plateau and in adjacent mountain regions this could be an exemplary model for reducing regional disparities by active support and structural exchange between affluent and disadvantaged areas.

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51 The European Union and Switzerland are cases in point.

52 Foggin 2008: 31.

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5.2 Integrating Agricultural and Pastoral Resources for Poverty Alleviation and Reducing Eco-pressure on Rangelands

Wang Jian⁵³

Abstract

Today people are paying more attention to pastoralism and rangeland management on the Tibetan Plateau not because of the delicious meat and milk produced there, nor the attractive scenery, but rather because of its changed function as a global ecological shelter. The livelihoods of pastoralists who have lived here for generations are relatively weak and large herds are putting increasing pressure on the rangeland ecosystem. It all happened under the backdrop of the government's continued efforts to promote the development of the plateau pastoralist communities. This means that we have to reflect on the mode of operation in pastoralism that is characterized by poverty, underdevelopment and a lack of eco-friendliness. This article aims to propose suggestions for pastoral practices that utilize the resources of agricultural communities to help reduce poverty in pastoralist communities by first re-conceptualizing traditional pastoralism, then analyzing the causes of poverty in pastoral areas and lastly studying the specific case of an integrated agricultural-pastoral development model and its feasibility.

1 Introduction

In Nagqu Prefecture of Tibet, between May and June of 2008, an untimely snowfall delayed the grass from turning green. The subsequent lack of fodder became the last straw that destroyed the already weak herds. 260,000 heads of cattle withered away. Local pastoralists suffered an economic loss of hundreds of millions of Yuan. After the disaster, what did we do? Did we do anything to prepare ourselves for the next big disaster? Obviously we can't say that nothing was done. In the past two years, the government completed the construction of houses for the pastoralist resettlement programme and the sheds for livestock and fodder. The government continues to support the restoration of pasture and fencing projects. Small-scale cultivation of pastures is being carried out. In addition, a pilot programme of payment for rangeland ecosystem services

53 Poverty Alleviation Office of TAR, Lhasa

has been put forward. The government also rewards the slaughter of livestock through cash awards, is improving the infrastructure in pastoral areas, is promoting universal free medical care and nine-year compulsory education and is increasing poverty alleviation and development efforts to help low-income families in pastoral areas. These efforts include raising the number of livestock, building stalls and sheds, fencing rangelands and encouraging alternative sources of income. These efforts have brought tremendous transformations in pastoral areas. However, if a huge disaster strikes again, we will still have to pay a great price because we have not repaired the most vulnerable link in the traditional pastoralist chain.

2 Re-conceptualizing traditional Pastoralism

The characteristics of traditional pastoralism have often been described and distinguished on the basis of their typology. In addition to the well-known aspects related to terminology such as nomadism, self-sufficiency and seclusion, there have to be highlighted aspects of self-sufficiency and short production chains. We will first look at the following survey of a pastoral village (Table 1), and then discuss two specific issues.

Table 1: Initial weights (in kg) for different age cohorts of yaks before the fattening process in 2009

Age	3 years	4 years	5 years	6 years	7 years	8 years
weight	96.5	148.5	170.7	209.6	226.9	263.4

Source: Meng 2009

Sibu Village (Sibu Ranch originally) of Tashi Gang Town, Maizhokunggar County, is a traditional yak-keeping village. There are 215 households, 1,360 people and seven thousand yaks in the village. The survey covered 172 households, 1,089 people, and 6,494 yaks, accounting for about four fifths of the total village households and their livestock. The average household surveyed raised 37.8 yaks. Of all the yaks, 38.1% were one to four years old, 33% were five to eight years old and 28.9% were eight years or older. The ratio of female to male was 62:38, with a calving rate of 7.2% and a slaughtering (including death) rate of 12.3 % in 2008. Of the slaughtered yaks, 2.5% are consumed, 3.9% sold and 5.9% lost to a variety of reasons. The survey revealed to us that the village households had more old yaks than calves, more bulls than cows, and more yaks that are still growing than those ready for slaughter and more yaks were lost than sold. The yaks are characterized by a poor nutritional status and slow growth. Only rarely is a yak under the age of nine years old slaugh-

tered. Yak productivity is very low, hence a weak contribution to enhancing the earnings and improving the lives of the masses.

Sibu is a yak farming village in Tibet with a long history of producing the famous Sibu yak. The situation of rangelands here is better than average. Livestock production in 2008 could be described as normal, with no extraordinary disasters. However, the herds' mortality rate still reached 5.9%, more than the percentage put up for sale or consumed. Meanwhile, the yaks' weight also increased very slowly. It took ten years for a yak to reach a body weight of approximately 300 kg. The low slaughter rate could be a result of both problematic thinking on the part of the masses, but also due to the slow growth rate of the yaks, thus not reaching the minimum requirement for slaughter.

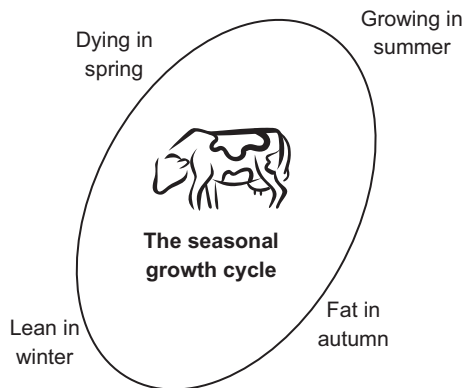


Figure 1: The seasonal growth cycle of livestock

2.1 The “rotation and revolution” of traditional livestock production

Rotation and revolution were originally terms used to describe planetary motions. Rotation here refers to the yak's growth cycle within one year, i.e. the growth status of four seasons. That is what we normally call “growing in summer, fat in autumn, lean in winter and dying in spring” (Figure 1). The annual Spring Festival is a weak link in livestock production. In normal grazing patterns, the growing season for grass covers only five to six months. The livestock have to cope with the nutrition supply and demand by their body for health and survival. However, we do not think that we should be numb to the high mortality rate because reducing the mortality rate of livestock will bring hope of life to herders. Only when they think that the herd's safety is under control, will they rationally adjust livestock structures and increase their slaughtering.

Revolution, here, refers to the life cycle of herds. In case a disaster becomes too destructive, the only rational choice of individual herders is to increase the size of their herd (Figure 2). Each household's efforts to increase the size of their herd would result in a tremendous pressure on the pasture and the rangelands. These rangelands cannot provide adequate nutrient reserves for winter herds. It is quite likely that after several years of growth the herds can experience frustrating setbacks due to a disaster. The impact of this kind of natural adjustment is monumental. Even rich herdsmen can be put back a few years. As for the poor households, they may become completely bankrupt. This cycle has continued, and the frequency of it is accelerating with the emerging global climate change. Today, people almost forget about the meat, milk, fur and other enjoyments that rangelands can provide, and instead concentrate more on pastoralism-related disasters.

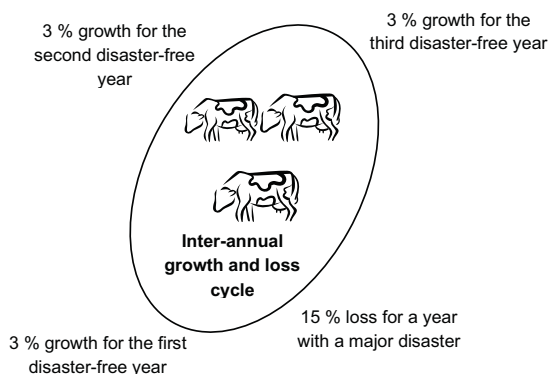


Figure 2: Inter-annual growth and loss cycle in the livestock sector triggered by disasters

The purpose of analyzing the inconsistency in the rotation and revolution of traditional livestock production is to point out that the production mode of nomadism does not provide enough storage of fodder for disaster protection and to highlight that individual herdsmen pursue the high-risk pastoral practice of constantly increasing the size of their herds. The biggest problem with both rotation and revolution is the lack of fodder. In this regard, it is safe to say that many lessons have been learnt: “Fodder comes first” and “Fodder is the foundation of pastoralism”. However, due to the constraint of a persistent mindset that seeks immediate solutions, the fodder resources available for the needy season are few. The high-risk pastoral practices have not been fundamentally changed.

2.2 The weak link of traditional livestock production

The biggest drawback of traditional livestock production is its weakness in the face of disaster. When a disaster strikes, livestock die. It is well known that nutritional imbalance across the four seasons exists. Although the death of livestock in summer and autumn is rare, their frailty in winter and spring may cause their demise if snow storms or strong winds occur and herds cannot graze for two or three days, with no forage from which to feed them.

Spring is also the calving season. Most adult and young cattle die at this time of the year. The events of two or three days in this period can determine the life of a herdsman for one or two years. When the herders look helplessly at the death of their future, they understand that no matter how hardworking they are, they cannot reverse fate. Poverty alleviation and development departments of the government usually provide compensation to households with fewer than 40–50 sheep units. However, with the arrival of another winter season, tragedy once again repeats itself. This kind of assistance model often makes officials regret the perceived lack of effort from the recipient pastoralists, but it does not raise enough doubt about the validity of our assistance approach.

In fact, the most vulnerable period of the herd's growth cycle is from February to May when for a few days outdoor grazing is impossible. The most vulnerable time of an animal's life cycle is when there are a few days of heavy snow and winds. During these fateful days, if they can be provided with effective help, the poor herders will be able to have stable livelihoods, which is the foundation for building a harmonious relationship between man and nature.

3 Causes of Poverty in pastoral Communities

In Tibet, the calculation of household income or wealth shows that pastoralist households are often richer than their counterparts in agricultural communities. However, in terms of quality of life, the situation is reversed. Even within the pastoral communities, development is far from balanced. Some wealthy herdsman may own 2,000 sheep, while most low-income herdsman own less than 100 sheep. In terms of the utilization of rangeland resources, it is “winner takes all” for the rich and vulnerable livelihoods for the poor. How does pastoral poverty happen? Let's take a look at Table 2.

Table 2: Differentiation between rich and poor pastoral households

Time-line	Rich households	Poor Households	Notes
before 1981	equal assets	equal assets	collective ownership
after dividing livestock among households	more livestock	more livestock	private ownership
	more labour	less labour	
	other enterprises	without other businesses	
	few accidents	many accidents	referring to diseases, etc.
	prepared for disaster	lacking disaster preparation	
when disaster occurs	coping possible	bankruptcy	

Source: author's own compilation

From the table we can see that before 1981, due to the implementation of the collective ownership system, livestock was divided equally among the herders, as was the use of the pastures. There was an even distribution of wealth. After that, the initiation of privatization saw the rise of household-run ranches. Although the redistribution of livestock was based mainly on household population, different herd sizes and different management abilities were soon to cause a difference in development.

Households with larger populations were allocated more livestock. With more labour, they could carry out more effective grazing, better utilize the rangeland resources and have spare capacity to experiment with sideline businesses and generate non-livestock incomes. Coupled with a stronger response to unexpected disasters and a relatively strong capacity to deal with diseases, they have earned a comparative advantage over small households with fewer livestock. When a disaster strikes, what happens for wealthy herdsman is equal to passive restructuring, with the number of weak animals reduced, but for small or poor households with a small livestock population, one disaster can lead to bankruptcy and poverty.

This also shows that the government's policy of "private ownership and private grazing" brings certain volatility to the pastoral area. It is in line with the laws of social development. However, no public policy can automatically bring equal benefit to everyone. After some people get richer, we must consider special as-

sistance policies to help the more vulnerable population. This is the country's current strategy.

The government's assistance package to help the Tibetan pastoral area can be described as "at all costs and regardless of the price". First, the infrastructure has been improved significantly. Not only do roads, power grids, solar power and safe drinking water facilities cover more and more pastoralists, but the pastoral communities are also the first in Tibet to have a railway and a large logistics centre. Second, schools, hospitals and other social infrastructure continue to improve with the pastoralist resettlement programme covering almost all of the herdsmen. Third, direct measures to support livestock production were put in place, including pasture irrigation, cultivated pastures, rangeland restoration (or a grazing ban), fencing, cattle sheds, fodder stalls and veterinary stations, payment for ecosystem services, processing plants, non-pastoralist industries and human resources development, and so on. These measures and the promotion of the rangeland contract responsibility system, together, have laid a foundation for the leap in development of pastoralism in recent years.

In all the state's measures to support the development of pastoralism and rangeland management, the measures for increasing production are the most sensitive. Rangeland pastoralism has its own laws and specific approaches when it comes to development and modernisation. Following the demands immediate changes are necessary; otherwise the aims would not be achieved. For example, the cultivation of large areas of pastures in the alpine belt, although it is possible, can only be fully understood by pastoralists given the right amount of time along with the right price relationship between fodder and meat. Other examples include the grazing ban and payment for ecosystem services. However, money in the pastoral areas can easily be consumed and it is difficult to turn it into a sustainable resource. Plus policy implementation is yet to be perfected. In short, the full support of the government to improve pastoralism and rangelands can only become good policies and turn into tangible benefits if the people who implement them know how to do so correctly.

The Central Authorities' Twelfth Five-Year Plan explicitly puts forward the requirement of harmonious development. The plan draws a blueprint for regional development that builds on regional economic strengths. It presents a clear positioning of the main zone functions, efficient use of land and space and the idea of man and nature living in harmony. The objective is to ensure sustainable national development and ecological security, while making certain that the people live a harmonious and prosperous life. In particular, we should find an efficient, sustainable and environmentally friendly development path. This requires us to seriously consider the design of public policies for pastoralism and

rangeland management. In terms of poverty alleviation and development, we can have the following guidelines:

- In order to increase support at the national level, we need to think outside of the pastoral development box, and consider the likelihood of using external resources to ease pressures on our own rangeland resources.
- In case of rapidly increasing population, livestock and per capita income, we should be even more concerned about the needs of the poor in pastoral communities, taking more effective measures to assist households and help them develop stable livelihoods for their families and finding their way out of poverty.
- Economic and social development does not automatically resolve the problem of poverty. There must be specific policies targeting pastoral poverty, prioritizing the development of vulnerable groups.
- Pastoral poverty reduction should be based on disaster prevention and addressing vulnerabilities. We must be determined to use the most effective resources to address the most likely causes of poverty. The faster the action, the more we can gain from the initiative.
- In order to change traditional livestock production involves introducing more market mechanisms to promote contact of the pastoral communities with the outside world, encouraging commercial and business activities in pastoral areas, encouraging herders to exchange their livestock products for fertilizer and other means of production and restoring the traditional exchange relations between agriculture and pastoralism.
- We must ease the pressure on the pastoral ecology and invest more energy in efficient, sustainable and environmentally friendly household-oriented business models. By improving household operations we hope to enhance the environmental conditions.
- Pastoral development is not only about building fairness and equity and intensifying poverty alleviation efforts, but also about having the determination to change the mode of development. In short, we are aiming to achieve transformation from a model of high consumption and low yield, regardless of cost, to a model of intensive use of resources with input-output balance, realizing our development by exporting products and services.
- Development of pastoralism and rangeland management must have solid scientific and technological support. Attention should be paid to data accumulation, lessons learnt and increasing investment in human resources.

Transforming the development mode of pastoralism in Tibet needs to happen, although it will be a very difficult transition. It will be achieved with the strong and effective support of the entire country and the hard work of the people in the pastoral communities.

4 Case Studies of integrated agricultural-pastoral Development

Tibet has a tradition of integrated agricultural and pastoral development, but it was interrupted by particular historical processes. Today people are worried about not just the problems in the growth cycle of rangeland pastoralism, but also the increasingly marginalized status of rangeland pastoralism. City dwellers in Tibet today can easily buy milk products made in mainland China. The market is flooded with meat and butter from neighbouring provinces. Local tanneries and woollen mills can purchase hides, fur and other raw materials cheaply from external sources. It seems that authentic local livestock products are fading out of people's lives. This is a very worrying trend. While we are burying our heads in the sand and being proud of ourselves for our self-sufficiency and independence, the tide of the market economy has been washing us ashore. Fortunately, farmers and herdsman in Tibet have made some inspirational efforts. The following four cases will hopefully provide us with insights. They look at agricultural-pastoral exchange, selling fodder for poverty alleviation, selling fodder for income generation and importing fodder for rangeland protection.

Case 1: In 2009, local leaders from the poverty alleviation department drew inspiration from a herdsman in Xiede Town, Shuanghu District, Nagqu, who separated a piece of cropland for fodder production and storage. The poverty alleviation office provided transportation subsidies to support the “meat for fodder” exchange programme. Local people negotiated an exchange of more than 3,500 kg of meat for more than 45,000 kg of oat hay with their counterparts of Qumei Town, Shigatse City, at prices of 21 Yuan per kg of meat and 1.64 Yuan per kg of fodder (Photo 1). As a result, households from Shuanghu District improved their disaster preparedness and the poor households from Qumei town increased their income from the sale of hay.



Photo 1: Oat hay from Qumei Town, Shigatse City, is traded against meat supplies (photograph © Wang Jian December 24, 2009)

In this case, we can see evidence of classic exchange relations. In 2009, the ratio of price of fodder and meat (per kg) was one to twelve: 21 Yuan per kg of meat and 1.64 Yuan per weight unit of fodder. People of Nagqu not only exchanged 3,500 kg of meat for 45,000 kg of fodder, but also embodied the spirit of self-organisation in the barter trade.



Photo 2: Fodder marketing in a poverty alleviation project in Wuma Town, Gaize County, Ali Prefecture (photograph © Wang Jian December 9, 2005)

Case 2: There is a small poverty alleviation project in Wuma Town, Gaize County of Ali Prefecture, which helps poor households plant and grow fodder. The four households included in the project planted more than 100 *mu* of fodder. They pack the fodder in used plastic bags (Photo 2) and sell it to farming households, who receive disaster preparedness checks from the government, at prices of one to two Yuan. Apparently, they make more money growing fodder than grains. These households have become more motivated in development. Their farming counterparts not only pass inspections from the government, but also enhance their disaster preparedness. Since fodder has a very good market potential, local fodder cultivation projects have been successfully sustained.

The merits in this case of growing and selling fodder for poverty reduction is worthy of recognition. Projects can be sustained if they are profitable.

Case 3: In 2009, Nierixiong Town, Shigatse City, and Anduo County of Naqu Prefecture sold 85,000 kg of oat hay at a price of 1.8 Yuan per kg (Photo 3). The income generated from growing hay is comparable to that gained by growing grains on land of a lower quality. Even without government intervention, the growth of oat hay is spreading quietly in these farming communities.

This case stresses that even in the grain-producing areas; farmers are selling fodder to increase their revenues. The steady spread of oat hay planting in agricultural areas shows that fodder plantations are popular with the masses.

Case 4: The yak fattening project in Sibü Village has been going on for three years. Herdsmen have turned it into a project of “importing fodder to feed cattle and ensuring more cattle slaughtered than lost”. This year all the yaks that are more than thirteen years old will be slaughtered. The following year, all of the male yaks above ten years of age will be eliminated. The project imports mixed feed from the mainland with ingredients including fermented corn stalks, corn, wheat bran, distiller’s grains, probiotics, salt, etc. The yaks are well-adapted to the feed and gain weight quickly. The cost for the fodder is lower than for fodder produced in Tibet.

The project appears to deviate from its target at first glance; however, in fact, it is now closer to the original purpose of the project. “Ensuring more cattle are slaughtered than lost” means that the old yaks are the first to be slaughtered, followed by those with the correct weight, then the fattened yaks who have reached a critical point and lastly those that have grown naturally. This way both efficiency and the quality of the meat products can be guaranteed. Imported feed from the mainland not only has nutritious ingredients and low prices, but also comes in bags that can later be used for the shipment of fertilizer from pastoral to farming areas.



Photo 3: Storing oat hay for marketing purposes
(photograph © Wang Jian December 24, 2009)

The above four cases are built around one key word: fodder! When cattle go through the most difficult lean days, the fodder will be worth several times its original value. When both adult and young animals survive, poor herders will feel hope for improvements. This is also the direction poverty reduction and development efforts are pursuing.

5 The Feasibility of an integrated agricultural and pastoral Development Model

Planting cultivated pastures on the plateau, nowadays, still faces some major obstacles. Therefore, the designed objectives of a poverty alleviation and development project that promotes an increased slaughtering rate of cattle by ensuring fodder availability, including providing an annual subsidy of 500 kg of fodder for each poor household and an estimated eleven days of disaster insurance forage for a herd of 50 sheep units. In addition, when a disaster strikes the project will provide disaster relief. If there is no disaster, then the subsidy goes to nutrition for weak livestock. The support will go on for five consecutive years. Each household should hand in 250 kg of livestock manure in return. Implementation of the fodder availability project does not prevent the poor herder households from receiving additional help or support. The fodder availability project is expected to start with a thousand households and then be gradually expanded.

The feasibility of the fodder availability project is based on the following factors:

- (i) The central government has a macro policy for supporting pastoral development and building an ecological shelter.
- (ii) The pastoralists are yearning for a new life and to be part of the national rejuvenation.
- (iii) The agricultural areas, particularly grain-producing areas in Mainland China, have an unlimited supply of straw and other residues. Mainland farmers can also increase their income through sales of surplus by-products.
- (iv) The central government gives support to large-scale water conservancy projects in Tibet. In the next few years, nearly 5 million new hectares of farmland will be irrigated.
- (v) The Qinghai-Tibet Railway has completed electrification in the section from Xining to Golmud. A modern logistics centre has been built in Nagqu, with adequate transport, loading and unloading capabilities.
- (vi) A number of research institutes and enterprises have made great strides in the research, development and marketing of niche livestock products.
- (vii) Part of the *Cordyceps*-related revenues can be directed towards supporting the development of livestock production.
- (viii) The building of physical and social infrastructure connects the pastoral communities with the outside world and opens a new era of development for the pastoralists.

If we seize these opportunities, then development of rangeland pastoralism in Tibet will certainly reach new heights.

6 Conclusions and Recommendations

To summarize the discussions, we come to a few conclusions regarding poverty alleviation and development on the Tibetan Plateau. We must adhere to the principles of “People First and Sustainable Development”. The household-based participatory approach to poverty alleviation should be implemented. We should rely on strong scientific and technological support, ensure fodder availability and promote an increase in the slaughter rate. We should integrate pastoral practices and agricultural resources, stabilize household operations and improve the value of aid in order to make more contributions to the development and ecological protection of pastoral communities.

We recommend that policy makers pay more attention to promoting an integrated agricultural and pastoral development model for the alleviation of

poverty and ecological pressures. The scientific community should dedicate more research efforts to this area as well. Organizations for human capital development in pastoral areas should attach more importance to capacity building for public service workers.

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5.3 Socio-economic Changes in Pastoral Systems on the Tibetan Plateau

Long Rui Jun, Liu Xingyuan, Cui Guangxin and Zhang Weimin⁵⁴

Abstract

The Tibetan Plateau covers 1.22 million km², 68.1% of which is covered by natural rangelands. This makes it one of the five largest pastoral areas in China. The livestock sector plays the key role in maintaining herders' livelihoods in the vast Tibetan Plateau, as no other agricultural activities can be supported at such high elevations – over 4,000 m. This therefore leads to the existence of a less complex socio-economic situation in the remote alpine pastoral system as compared to the cropping-livestock integrated farming systems in the lowland areas of Central China.

There have been three changes in the socio-economic situation that can be categorized into distinct phases: Phase-I from 1959 to 1969, Phase-II from 1965 to 1984 and Phase-III from 1984 to the present. Social institutional changes occurred mainly between 1951 and 1984, including the shift from the feudal⁵⁵ serfdom system to a democratic system in 1959, and the shift from the People's Commune System to the Household Contract Responsibility System in 1984. These adjustments resulted in great changes in the context of livestock and human population, culture and education, and herders' lifestyles and living standards.

With these social changes, the economic situation also changed dramatically in Tibet. This can be reflected by changes in the composition of the GDP in terms of the primary, secondary and tertiary industries in different periods. In 1959, the GDP from the primary industry (73.6%) formed the main component of the total GDP of Tibet, which means that Tibet was a typical pastoral-agricultural society before 1959. Afterward, this proportion declined significantly. At the same time, the other industries increased greatly. By 2008, the percentage of the GDP contributed by the livestock-framing sector was only 15.3%, but the tertiary (service) industry accounted for 55.0% of the TAR's GDP.

54 All authors are affiliated with the International Centre for Tibetan Plateau Ecosystem Management, Lanzhou University, Lanzhou, Gansu Province, PR China.

55 The feudal upper class refers to aristocrats, government officials and upper class monks before the democratic reform in 1959.

The average annual incomes of herders and farmers increased almost 18 times from 175 Yuan in 1978 to 3,176 Yuan in 2008. However, the Engel Coefficient indicates that the living standard of over 60% of Tibetan rural residents is below “well-off”. Compared with the rural residents of the whole nation, Tibetan rural residents have less income and spend a larger proportion of their income on food.

Some factors that impact on social and economic changes, including policies, tourism, the development of niche products and natural hazards are discussed in this chapter. It is suggested a coupled valley cropping and mountain pastoral system should be implemented in order to alleviate overgrazing upland while increasing incomes in both the uplands and lowlands. For the long-term sustainable development of pastoral areas in Tibet, an out-migration leading to a higher education among former pastoralists should be included in the strategy instead of a passive and temporary migration system.

1 Introduction

Tibet is reputed to be one of the five largest pastoral areas in China. It has 82.07 million ha of natural alpine rangeland, representing 21% of the total natural rangelands of the nation and 68.1% of the total land area of Tibet. Grazing livestock plays the most important role in herders' livelihoods in the vast Tibetan Plateau, where no other agricultural activities exist because of the high elevation of over 4,000 m, on average. The high altitude results in the air temperature remaining too low to allow for a free-frost period in the year. Given the harsh natural, environmental conditions, the traditional alpine pastoral production system requires extensive management and its output is comparatively meagre. Thus leading to a less complex socio-economic situation in the remote alpine pastoral system compared to the cropping-livestock integrated farming system in the lowland areas of central China. In reviewing the socio-economic changes in the plateau pastoral systems of the Tibet Autonomous Region (TAR), three main stages have been identified and are explored below.

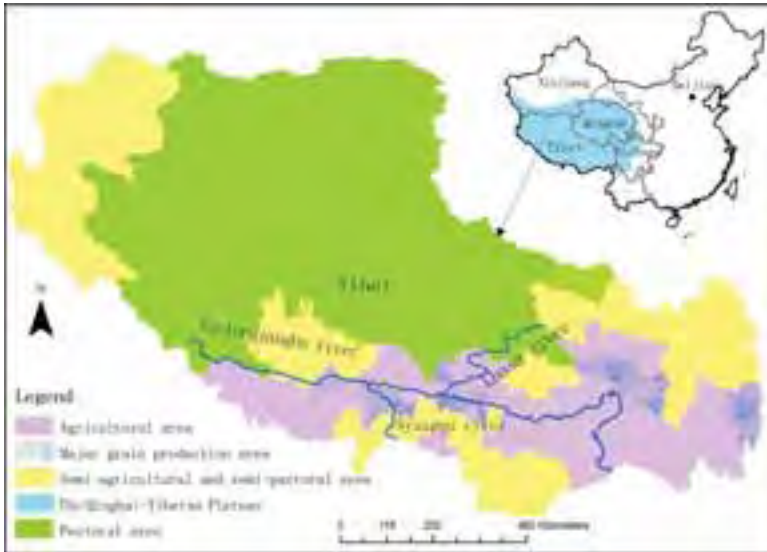
- Phase-I from 1959 to 1969: The democratic reform of the Government of the TAR. Before 1959, the social system in Tibet was characterized by a feudal serfdom system, with the feudal upper class (5% of the population) owning 95% or more of the productive materials, such as land and livestock. In 1959, democratic reforms were carried out. Therefore, a private economy gave ownership to the farmers and herders, which prompted rapid economic development.

- Phase-II from 1965 to 1984: During this period the central government released a series of policies to encourage economic development in Tibet. However, the negative impact of the “cultural revolution” (1966–1976) on the socio-economic development of Tibet resulted in reform in Tibet. Tibet was not opened-up to the outside world until nearly six years after mainland China became accessible from overseas.
- Phase-III from 1984 to the present: In 1984, when the positive achievements and benefits from the reform of the “Household Contract Responsibility System” (HCRS) had been experienced and the inland areas were opened-up, these policies were extended to the TAR. In pastoral areas livestock was owned and raised by individual herder households. In this regard, 1984 is usually regarded as a key year for Tibetan pastoral systems as it influenced most changes that took place in the socio-economic system of the pastoral areas of the TAR. This chapter will mainly address these changes in the pastoral systems of the TAR after 1984.

2 General geographic and natural Conditions in the TAR

The Tibet Autonomous Region (TAR) is located at the border area of Southwest of China. Its borders touch India, Nepal and Bhutan in the south, and it is connected to the Kuumar Region in the west. The TAR covers 1.22 million km² ranging from E 78° 25' to 90° 06' and N 26° 50' to 36° 53'. It connects with the provinces of Yunnan, Sichuan, Qinghai and the Xinjiang Uygur Autonomous Region. With an average altitude of over 4,000 m above sea level, it forms the main body of the Qinghai-Tibetan Plateau (Figure 1).

Given this unique geographical condition, the climate in the TAR varies gradually from warm and moist to cold and dry from the southeast towards the northwest. The vegetation changes from forest, bush, meadow and steppe to desert. The complex and varied landscapes and ecosystems have created a natural paradise for biodiversity. More than 85% of the total land area in the TAR is used for animal-husbandry or farming-pastoral production (Figure 1). The north and northwest parts of Tibet are the main areas of pastoralism. Therefore, the socio-economic changes in these areas provide an overview of the entire pastoral system in Tibet.



Source: Cui et al. 2011

Figure 1: Land use and agricultural patterns on the Tibetan Plateau

3 Social Changes

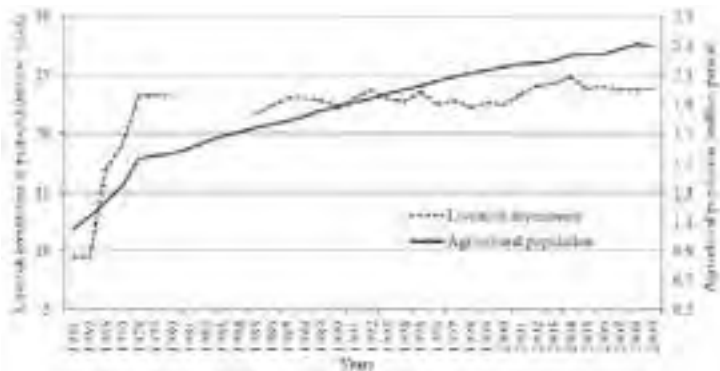
3.1 Institutional changes

In the past 50 years, a tremendous change has occurred in Tibet in terms of political institutions, economic structure, culture, etc. Before 1959, Tibet basically ran a feudal serfdom system, which meant that all productive materials, including the rangelands, livestock and even nomadic herders, were privately owned by a small feudal upper class. In 1959, the feudal serfdom system was abolished and replaced by a democratic system. Consequently, the herders and farmers owned their own rangeland and livestock, as a private economy was set up. This prompted rapid economic development. In 1965 the Government of the TAR was formally established. Following this, the collective ownership of productive materials was started under the People's Commune System. This institutional change was in existence until 1975. The socio-economic development of Tibet was impacted negatively by the "Cultural Revolution" (1966–1976). This resulted in the "Household Contract Responsibility System" (HCRS) and the opening-up policies being implemented in Tibet only in 1984, nearly 6 years later than occurred in inland China.

3.2 Population and life expectancy changes

Since the peaceful liberation of Tibet in 1951, its population increased from 1.23 million in 1959 to 2.87 million in 2008, with the local Tibetan population having changed from one million to 2.7 million. Tibet's population changes can generally be divided into five stages. During the first stage, from 1951–1958, it had a high mortality rate and a slower rate of population growth. The second stage, from 1959 to 1969, saw the population rapidly increase in the TAR. The total population reached 1.4 million in 1969, with an increase of 274,300 people compared to 1959. In the third stage, from 1970 to 1984, the total population in the TAR increased significantly, achieving 25‰ annual birth rate and 18‰ annual natural population increment rate. From 1985 to 1997, the total population in the TAR increased to 2.47 million in 1985 from 1.99 million in 1977, with an increase of 20%. In the past 10 years, the annual natural population rate remained at 10‰, and by 2008, the total population in the TAR amounted to 2.87 million, a 1.87 times increase from 1950. At the same time, the proportion of the rural population remained at about 80% of the total population in the TAR (Figure 2).

Currently the average lifespan of a Tibetan in the TAR is 67 years, while it was only about 35.5 years before the democratic reforms of 1959. The huge investment from the central and local governments for a rural and urban public health service system in the TAR enabled local farmers and herders to receive free public health service, which greatly enhanced the longevity of the local people.



Source: data adapted from Tibet Statistical Yearbook 2009, 2010 and China Statistical Yearbook, 2009

Figure 2: Dynamic of agricultural population and livestock inventories at year-end from 1951 to 2009

3.3 Culture and education changes

Living for thousands of years on the Tibetan Plateau, the Tibetans have developed their own distinctive and diverse culture through their understanding of, and adaptation to, nature, communicating and fusing with other cultures from neighbouring ethnic groups. Tibetan culture can be determined mainly by its language, philosophy, religion, medicine, astronomy, music and dance, drama and folk performing arts, architecture, sculpture and painting and crafts. Such an abundant culture provides a spiritual pillar for the daily life of Tibetans. Since the 1980s, the state has been providing over 1.2 billion YUAN and a large quantity of gold and silver to Tibet to support Tibetan Buddhism, through the preservation and repairing of monasteries, cultural relics and sites of historical significance, and also through the development of diverse publications. Today, over 1,700 religious venues accommodate more than 46,000 monks and nuns in Tibet.

Before 1951, the ordinary labourers of Tibetan were robbed of any educational opportunities. Between 1952 and 2007, the state invested 22.562 billion Yuan in Tibet for educational development. The majority, 62%, of this investment was made between 2002 and 2007 to improve the educational infrastructure, including old educational organizations and building new schools and institutes. At same time, other inland provinces and cities also donated financial, material and physical assistance to support the education sector in Tibet. Since 1985, a policy of compulsory education with free-tuition, together with free food and boarding for students coming from agricultural and pastoral families through the 6th has been carried out. In 2007, this policy was extended to cover the entire TAR. Thus, allowing Tibet to be the first location in China to benefit from free, compulsory education. Given top-priority consideration by the central government, the enrolment rate of school-aged children has risen from 2% previously to 98.2% currently, while up to 91% are enrolled in junior high schools (Figure 3). Thus, the illiteracy rate has fallen to 4.76% nowadays, compared to 95% before.



Source: Cui, et al. 2011

Figure 3: Student enrolment per 10,000 persons in Tibet over the years

3.4 Life style and quality changes

In the past, most herders in the TAR relied on livestock production, traditionally enjoying a nomadic life style. The traditional nomadic livestock production system in the TAR was determined by its degree of social organisation and its unique ecological environment. More than 90% of herders made their living with a nomadic lifestyle without a private, settled house prior to 1959. Afterwards, although some herders gradually built their own houses to live semi-settled or fully-settled lives, the living conditions were still poor. However, in the past ten years, the TAR has invested in rebuilding houses and constructing settlement centres for nomadic herdsmen in pastoral areas. About 420,000 families of herders and farmers, accounting for 80% of the total rural residents, have moved into new houses so and are able to enjoy stable, safe and comfortable lives. Nomadic grazing, semi-settled grazing and settled Tibetan transhumance grazing are still the main livestock production and management approaches.

4 Economic Changes

4.1 Changes to the composition of the industry

With social changes in the past decades, the economic situation has also changed dramatically in Tibet. This can be reflected by the compositional changes of the GDP in the context of the primary, secondary and tertiary industries in different years (Table 1). In 1959 the GDP from the primary industry (73.6%)

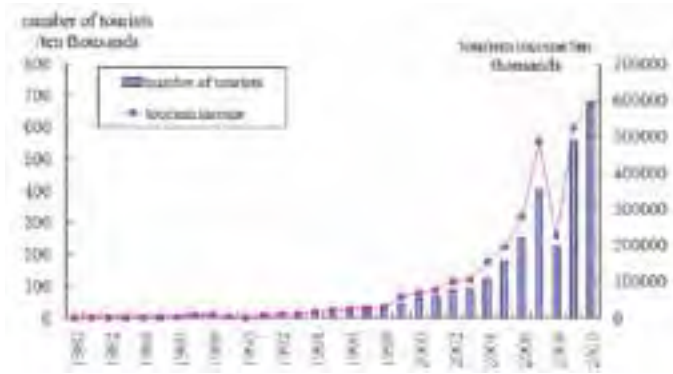
formed the main basis of the total GDP of Tibet (Table 1), while the secondary and tertiary industries were only 12.6% and 13.8% respectively. This indicated that Tibet was a typical pastoral-agricultural society then.

Table 1: Composition changes of GDP in the context of the primary, secondary and tertiary sectors for different years in Tibet

Sector Year	Primary sector: agriculture and livestock-keeping	Secondary sector: industrial enterprises	Tertiary sector: service industries
1959	73.6%	12.6%	13.8%
1984	46.5%	20.5%	33.0%
1997	37.8%	21.9%	40.3%
2003	22.0%	25.7%	52.3%
2008	15.5%	29.5%	55.0%

Source: data adapted from China Statistics Press 2009, 2010

In 1984, the reform of the “Household Contract Responsibility System” (HCRS) and the opening-up policy were extended to the TAR. This resulted in the individual ownership of livestock by herder households in pastoral areas. Therefore, 1984 is regarded as a key year in the reform of the Tibetan pastoral system, as it pushed development of the pastoral areas. However, the composition of the primary industry in the GDP of the TAR dropped to 46.5% in 1984, while secondary and tertiary industries increased by 62.7% and 139.1% respectively. These changes imply that the primary sector started to lose its prominent position in the TAR’s economy. From 1997 to 2008, the ratio of the livestock-agricultural sector in the GDP of the TAR was continuously declining, with the smallest contribution seen in the last 10 years. At the same time, the services (tertiary sector) jumped to become the largest component of the GDP in the TAR, including the contribution of tourism income (Figure 4). In this period the secondary industry was also getting stronger and taking the middle place between the other two industries. This pattern implies sound regional economic development.



Source: Cui et al. 2011

Figure 4: Number of tourists and tourism income of Tibet over the years

4.2 Changes of herders’ incomes

Although pastoral-agricultural sector in the TAR’s GDP was getting smaller compared to the other two industries after 1997 (Table 1), the net incomes of herders and farmers increased dramatically in the past three decades (Table 2).

Table 2: Herders and farmers net incomes in the past 30 years (in Yuan per year)

Yuan	Year	1978	1984	2001	2008
Average herders/farmers income		175	446	1,404	3,176

Source: data adapted from China Statistics Press 2009, 2010

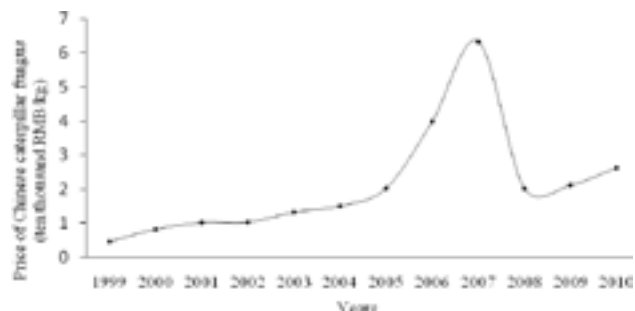
Table 3 indicates that the average numbers of livestock (yaks, sheep or goats) per agro-pastoral person in the TAR was 14.6 in the period from 1965–1980, and saw a slight declining trend down to 10.5 units by 2005–2009. But livestock and human populations were expanding although the extent varied in different periods. This means that the total population of both of livestock and humans increased over the entire period. Compared with big differences in incomes over different periods (Table 2), this implies that the high incomes after 2001 were driven by increases in the prices of livestock and livestock products, and the high commercialization rate. In 2008, the proportion of cattle, pigs and sheep delivered for sale was 19.8%, 57.2% and 30.8% respectively. These figures were less than 10% prior to 1959. However in the past 10 years, the

source of income for agro-pastoral people has diversified, and incomes from the Caterpillar fungus might contribute substantially in some areas (Figure 5).

Table 3: Changes of the livestock and human populations in different periods

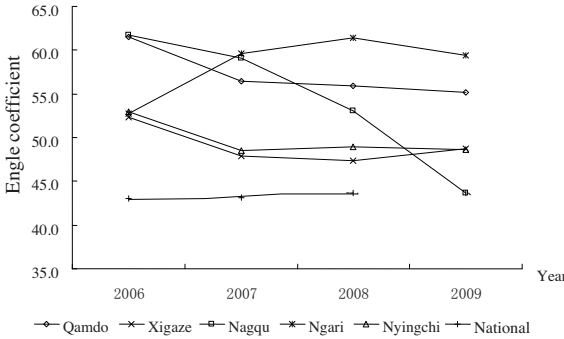
Item	Period	1965–1980	1985–1992	1993–2004	2005–2009
Average livestock numbers (head/agro-pastoral person)		14.6	12.4	11.0	10.5
Growth of livestock population		37.9%	9.7%	4.5%	-0.04%
Growth of human population		26.4%	11.9%	13.1%	2.6%

Source: data adapted from China Statistics Press 2009, 2010



Source: data adapted from China Statistics Press 2009, 2010

Figure 5: The dynamic development of prices for Chinese Caterpillar fungus from Naqu in Tibet from 1999 to 2010



Source: data adapted from China Statistics Press 2007, 2008, 2009 2010

Figure 6: Change of Engel coefficient of Tibetan rural residents of main pastoral region

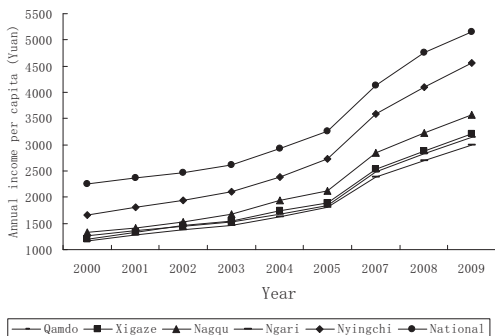
The Engel coefficient (EnC) refers to the proportion of residents' living expenses that is spent on food.

Table 4: Relationship of EnC values and living standards

Item	EnC value				
	>60%	50%–60%	40%–50%	30%–40%	<30%
Living standard	Poor	Just meets the demand for food and clothing	Well-off	Relatively rich	Rich

Source: <http://baike.baidu.com/view/28093.htm>

The data showed in Figure 6 and Table 4 indicate that Tibetan rural residents living in Qamdo, Naqu and Nagri were just meeting their demand for food and clothing, with the people of Naqu not even being able to satisfy these needs in 2009. After 2006, the living standard of rural residents living in Xigaze and Nyingchi increased to well-off from poor. Compared with the rural residents of the whole nation, Tibetan rural residents have lower incomes (Figure 7) and spend a larger proportion of their income on food (Figure 6).



Source: data adapted from China Statistics Press 2009, 2010

Figure 7: Annual income per capita of rural residents in pastoral area of TAR.

Unit: Yuan (RMB)

5 Driven Factors to social and economic Changes

5.1 Support from priority policies

Since 1980, the central government has held five Tibet Work Symposiums to deal with the socio-economic development of the TAR. The central government's transfer of fiscal payments to Tibet is a major way in which it is trying to help to improve Tibet's development. The money transferred to Tibet from 1959 to 2008 accounted for 201.9 billion Yuan, in which about 76.3% was contributed between 2001 and 2008, thus making up 93.7% of the TAR's financial revenue in the same period (China Statistics Press 1990). In the past two decades, some of the transfer payments were provided in the form of investments in development projects in Tibet. Thus, a total of 1,145 projects have been carried out in Tibet including projects that addressed: environmental protection, transportation, tourism development, niche products and marketing development, poverty alleviation, natural hazards prevention, improvement of native rangelands and feeding systems, breed improvement, payments for ecosystem services and a series of infrastructure projects related to agriculture and pastoral sectors that took place in the middle valleys of the Yarlung Zangbo River and the Lhasa and Nyangqu Rivers since 1990.

In recent years, more attention has been paid to improving pastoral and agricultural development through the provision of huge subsidies for productive materials such as seeds, chemical fertilizers, machinery, diesel oil, etc. This enables farmers in Tibet to purchase their materials for pastoral and agricultural

production at prices 30–50% lower than those in other areas of China. This measure also plays an important role in reducing farming costs and boosting pastoral and rural development.

5.2 Tourism and the development of niche products

Tibet has unique advantages due to its tourism resources of the nature, culture and food. Tourism first began to be developed in 1984, when the reforms were made and the opening-up policy was carried out. Since operation of the Qinghai-Tibet railway in 2006, the TAR's tourism has seen rapid development. Thereafter, millions of Chinese and foreign tourists have visited Tibet each year, which has led to a significant contribution to the TAR's GDP and revenues (Figure 4). In addition to tourism centre of Lhasa, tourism has also spread to Xigaze, Shannan, Nyingchi, Nagqu, Ngari, Qamdo, etc. This has led to a significant increase in local employment and in tax revenues, and has also raised the living standards of both urban and rural residents.

On the other hand, due to the increase in tourism and national and international marketing requirements some niche products, such as the caterpillar fungus (*Cordyceps sinensis*) and different herbs also contribute greatly to the incomes of herders and farmers in many counties of Tibet. Although caterpillar fungus is distributed across more than 56% of the counties of the TAR, its major production areas are concentrated in Qamdo, Nagqu, Nyingchi and Shannan, which contribute about 20% of the total national production. Between 2005 and 2008, the average annual production capacity was 50,000 kg in the TAR, worth three to four billion Yuan. This is about 1,500 Yuan of net income for each herder or farmer in Tibet. In some core areas of caterpillar fungus, this figure would account for over 80% of net incomes annually, reaching up to 4,000–5,000 Yuan per person. However, the proportion of caterpillar fungus in local incomes will be influenced greatly by its price fluctuations (Figure 5) and the annual production capacity.

5.3 Effect of natural hazards

Natural hazards, particularly heavy snow disasters, have always played a key role in the worsening of herders' living conditions. When a snow disaster takes place in winter or spring it can lead to a family losing a large proportion of their livestock, if not all of their animals, in only a few days. Therefore, snow disasters frequently impose adverse impacts on pastoralists' lives, but also result in the instability of livestock husbandry on the Tibetan Plateau. Figure 8 indicates that there were more than 18 million livestock that died due to snowstorms from 1974 to 2009 in the Eastern parts of the Qinghai-Tibetan

Plateau. There were 2.27 million animals that disappeared because of snow disasters in the Northern part of Tibet between 1980 and 1990. Therefore, preparing for natural hazards and reducing the resulting losses from natural hazards are the main tasks for local officials and herders in the TAR.

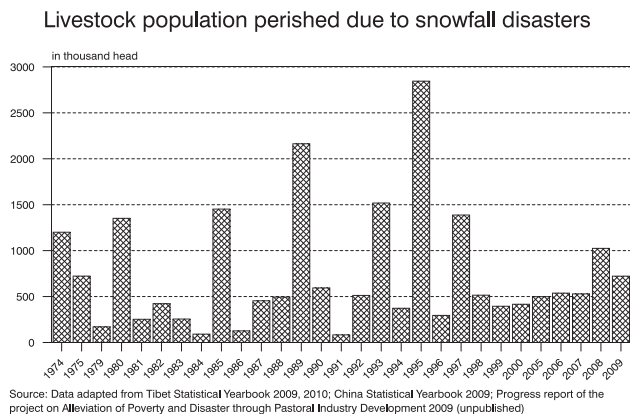


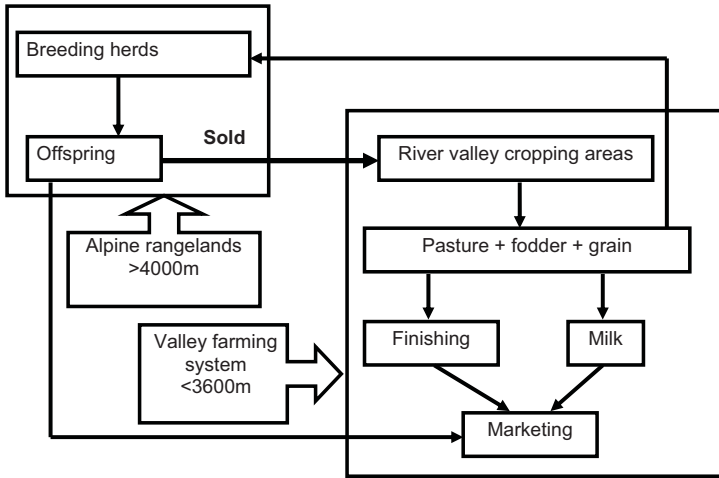
Figure 8: Livestock population perished due to snowfall in high pastures in the eastern part of the Qinghai-Tibet Plateau from 1974 to 2009

6 Suggestions

6.1 Coupled valley cropping and mountain pastoral system

Almost 90% of the alpine rangelands in the pastoral areas of the TAR are currently suffering degradation, to some extent, resulting from severe overgrazing, socio-economic pressures and the impacts of global warming. At the same time in the cropping areas of the valleys of the three rivers – the Yarlung Zangbo River, the Lhasa River and The Nyangqu River (Figure 1) – a certain proportion of straw and agricultural by-products are not being fully used by the livestock. The cropping area is large, covering 180 thousand ha, which accounts for 50.5% of the total cropping area of Tibet (Nyima Tashi 2009). Thus, a coupled valley cropping and alpine mountain grazing system could be achieved in terms of space, function and benefits (Figure 9). Under this framework, either more animals have to be evacuated from grazing lands and can be sold to cropping areas for consumption or the surplus fodder from cropping areas needs to be transported to the uplands in order to alleviate the overgrazing of the rangelands while increasing incomes both in the upland and valley areas. By providing better alpine rangeland ecosystem services, the capacity for tourism

would be increased and the production of caterpillar fungus would be increased as well. Through proper processing, value-added animal products from cropping areas would be able to meet some of the demands of tourists during the few months of the warm season.

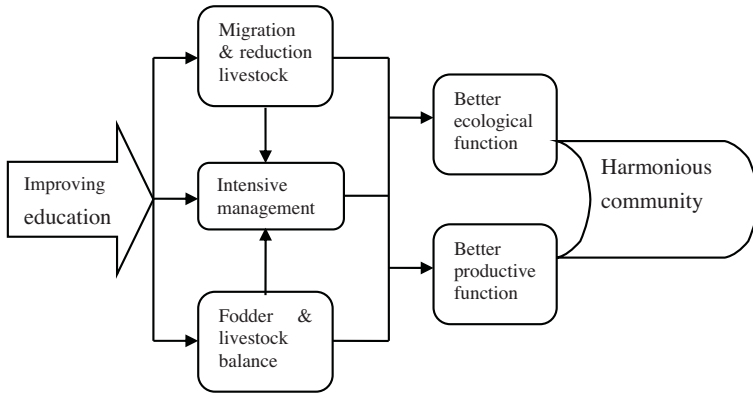


Source: Long et al. 2011

Figure 9: Coupled valley cropping and mountain pastoral system

6.2 Active-education migration model

Education always plays a fundamental role in driving socio-economic development. A well-educated young generation with diplomas and academic degrees can find jobs in off-pastoral areas or cities. Thus, this group of people will form the mainstream of a formerly predominantly rural society, permanently migrating outside of the pastoral and farming areas of the TAR. Therefore, the improvement and development of the education sector in pastoral areas needs to be prioritized in the TAR (Figure 10). Migration efforts should be focused on the younger generations rather than the current labouring generations (parents and grandparent) through providing them with a good education in order to create access to more job opportunities for them in off-framing areas. Thus, a long-term sustainable development of the pastures would be achieved based on an active and permanent migration system, rather than a passive and temporary one.



Source: design by authors

Figure 10: Active-education migration model in pastoral areas of Tibet

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5.4 Recent Changes in Pastoral Systems in Tajikistan

Yodgor Qonunov⁵⁶

1 Background

The Pamir Mountains are located in the most mountainous area of the Republic of Tajikistan and occupy 637,000 thousand km² of land, accounting for 44.6% of the total area of the Republic. This mountainous zone is covered by varied landscapes including sub-tropic, alpine, eternal snows and freezing high-altitude deserts, where valleys alternate with steep, rising mountains. It is in this zone that the highest mountain systems converge – the Tien Shan, the Hindukush, Kun-Lun and the Karakoram. The area is isolated from both the humid cyclone air-streams from the west and the atmospheric precipitations formed by monsoon winds in this part of Asia.



Photo 1: From the river level at the Pjandsh (subsequent Amu Darya) the slopes of the Western Pamirs provide the habitat for combined mountain farmers and pastoralists up to the snow-clad peaks such as Karla Marksa at 6723 m (photograph © Hermann Kreutzmann July 17, 2010)

56 Inspection Unit Manager, Natural Conservation Department, Government of GBAO.
The paper is an abbreviated version of a presentation during the Khorog Workshop 2010.

In the Gorno-Badakhshan Autonomous Region (GBAO) that occupies nearly half of the total area of the Republic, pastoralism is the main pillar of the rural economy, based chiefly on natural grazing pastures.

The alpine and sub-alpine pastures of the Pamirs constitute around 1.2 million hectares and are located 2,000 to 4,500 thousands meters above sea level, with the corresponding combination of climatic, grazing and other conditions. On these pastures, it is difficult to maintain cows, sheep and horses in the summertime, and it is practically impossible to do so successfully in the wintertime. Despite the specific conditions of the landscape, including the steep slopes, the poor soil quality due to the plethora of stones, and the deeply-incised, shady valleys, the hay meadows and pastures of the mountainous districts of the GBAO have been a reliable source for the production of nutritious and cheap fodder for the breeding of pasture animals (Photo 1). When utilized efficiently the hay meadows and pastures of the region can produce between 80,000 and 100,000 tons of fodder annually. Currently, however, only 55–60% of this fodder production is being utilized. Many remote mountain pastures produce up to 60–70% livestock products per annum.

Along with the above, the lack of regular maintenance and unsystematic utilization of natural fodder-producing lands, especially in the winter pastures, has resulted in the pastures low level of productivity of 0.5–0.6 hectare in dry weight from one hectare. This has contributed to the degradation of the green coverage and has delayed further development of breeding in the area.

Based on the data provided by the Committee on Land Utilization of the GBAO, there are a total of 750,670 hectares of land under pasture. Of this land, 112,491 hectares are state-owned; 18,948 hectares are under the reserve of the Forestry Department, and 116,943 hectares of land have been dedicated as specially protected areas or areas of untouched nature. 1,702 hectares of land are covered by industrial facilities, including communication and roads. The vast majority of the pasturelands, 500,586 hectares or 67 % out of the total area are attached to agricultural production facilities (Figure 1). Further breaking down this area of agricultural production facilities, they report that 408,722 hectares of land are utilized by farming households, 272 hectares of land are used as kitchen gardens, and 76,360 hectares of land are used by the state-owned agro-industrial enterprises of the region.

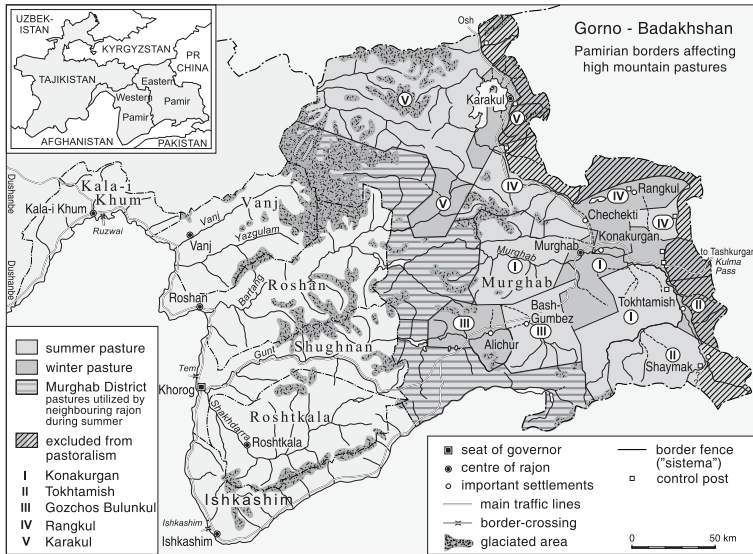


Figure 1: Gorno-Badakhshan – Pasture utilization in the Eastern Pamirs (design and © Hermann Kreutzmann)

2 Current Management of Pastures and the Development of Livestock-breeding

According to data from a science-based system of monitoring the agricultural economy in the Pamirs 96.4% of the area (757 thousands hectares) consists of pastures. A significant decline of the green cover, low harvests, and predominance of rough and nearly indigestible fodder during the winter season and a predisposition of extensive usage of the field are problems that are being faced in this region. This results in the exploitation of pastoral areas located in the central part of the mountain range in order to meet the requirements for animal fodder.

In the summer pastures livestock grazing begins in the middle of June and lasts until mid-September, after which the animals are taken to the winter pastures. These pastures are situated on the wide valleys between the hills and in gorges among the mountains.

Early spring is a critical time for the animals, as the winter pastures have not yet grown but driving the animals to the lowlands is not yet possible.

During the second half of June the larger bulk of the animals – yaks, sheep, and goats – are driven out of the valleys to the slopes of the river tributaries, where grazing takes place until the first half of September. Natural pastures being used as the only available source of food for animals has forced people to resort to private and long-distance pastoralism (Photo 1). Observations showed that in the course of a year the location of temporary stopping stations and grazing grounds changed no less than ten times. Distances of 5–10 km and even up to 50 km were travelled. Preparation is necessary for such movement and involves setting up yurts and other activities. The duration of time spent grazing in each location is determined taking into consideration the productivity of the specific pastures. A loss of live weight due to maintaining the animals exclusively on the grasses of the foothills has been observed among all species of animals, but the magnitude of this loss depends on the degree of the adaptation of the animals to the over-exploitation of the winter pastures.



Photo 2: Yaks grazing on the shore of Lake Karakul, Murghab District, Gorno-Badakhshan with Pik Lenin Range in the background (photograph © Hermann Kreutzmann March 31, 2003)

2.1 Factors contributing to the effective management of pastures

- The mobility of domestic animals in the Eastern Pamirs, especially in Jawshangoz and Kuytezak is as high as previously, with the small exception of pasture animals in Jawshangoz moving to remote summer pastures every year.

- Major owners keep their animals in good shape. They have permanent usage rights to the pastures and they reduce the number of heads of animals they have in the autumn in order to be able to feed them during the long winters.
- Shepherds of public herds are not always passive participants receiving pasture animals. In some cases, it is the shepherd who organizes the rent of the pastures, collects taxes for the use of pastures and controls the overall size of the herd. He controls the numbers because if he does not bring back the animals in sound condition he will not be trusted with the herd next year.
- In the Eastern GBAO, especially in Jawshangoz, the herds are still small in size. During the Soviet times, the average size of a herd in the summer season was around 1,000 heads of small domestic animals, while the average number today is 450 heads.
- Generally, the pastures are used as follows: in the summer animals are brought from Khatlon Region to Taweeldara District and in the winter the herders of Taweeldara move back to Khatlon Region. In the Village Council of Saghridasht, in the Western part of the region, state farms and major farming households conducted negotiations about land use with the Local Government of Darwaz District, GBAO. Private economic units from individual districts such as Muminobod and Panj have access to pastures only with the authorization of the State Farm Administration. Communities often create special agreements with individual herders and private owners in order to have access to the pastures in the Eastern or Western Pamirs. In the majority of villages, access to the pastures of the nearby valley is easy.

2.2 Factors threatening the good management of pastures

- In the western part of the GBAO, particularly in Saghridasht the size of the herds are still somewhat large, corresponding to the norms of Soviet times, despite the fact that the total number of animals is low.
- Some of the animals that are used for milk are grazed on the pastures around the village all year-round, which has resulted in serious degradation of the pastures, as was observed in Saghridasht. This is despite the high degree of mobility of the domestic animals that is normally seen.
- In some areas of the Eastern Pamirs, the number of locations used as grazing grounds throughout the year decreased because the animals remained in the spring-autumn pastures throughout the year without moving to the highland pastures in June. Additionally, a relatively

small portion of animals are nowadays driven in the summertime to Jawshangoz, due to transportation difficulties and concerns about the dangers on the road in Roshtqala District. Therefore, it is possible that the concentration of animals is comparable to what was seen in Soviet times in the lower parts of the valley.

- In Jawshangoz, desolate regions located around Turumtay-kul Lake are not exploited as pastures because of the presence of poisonous plants such as *astragal* or *lindelophia* that would lead to the loss of animals. In some places, the local herders find and liquidate these poisonous plants.
- Some pastures of Saghridasht still remain mined, thus forcing the herders to seek other places for the animals to feed, which sometimes leads to conflicts with other users.
- In the opinion of a number of respondents the winter pastures in Jawshangoz have been exploited to their limit, and it is impossible to graze animals there for the rest of the season. These pastures may be most exposed to degradation.
- In the western part of the GBAO, especially in Saghridasht, the largest threat to pastures is land cultivation. In the first years after the soil is ploughed the land remains naked or overgrown with marshes. It can take up to 20 years for the pastures to regenerate.

2.3 The Condition of natural Fodder Crops Area in the GBAO

Animal-breeding in the GBAO is one of the main pillars of the rural and public economy. Its direct development depends on the strength of the food base. At present, out of the total number of the animals in the region between 75% and 95% are being provided with animal food from natural pastures. However, in the main, the pastoral land assets are located in difficult mountainous locations.

In our region, two classes of pastoral land assets are distinguished on the basis of natural-climatic conditions and that of plantation cover (natural) as follows:

- (i) Mountain-desert origin on mountainous black-soil lands, brown and chestnut (coloured) soils.
- (ii) Mountainous half-desert on light chestnut colour, light and grey mountains types of soils which are in turn divided into three sub-categories: of plain origin, of desert-plain origin and of steppe origin.

Of the two classes of fodder land assets listed above, 79% of the region consists of mountainous half-desert pastures. Based on their climatic characteristics, mountainous grazing lands are extraordinarily varied in composition.

Only insignificant cultivation areas exist and those are concentrated in the north-western part of the region (in Darwaz District in the Saghridasht and in the eastern part of Murghab District on the banks of the rivers and lakes. Pastoral lands are represented mainly in dry valleys, 92%.

Depending on the ecological conditions and the state of the economy, the vegetation of natural grazing land consists of thorny bushes and grasses of varied composition, whereas in the highland eastern part they consist of meadow types and alpine thorny bushes.

Mountainous natural grazing lands are characterized by unsatisfactory amelioration. Up to 31% of their area is covered with bushes and thorns.

The area of green grass cover in the region comprises 596,783 hectares, where 72% is made up of remote eastern pastures (Oqtash of Rushan District, Burunkul of Shognan District, Jawshangoz of Roshtqala District and Murghab District).

During the Soviet Union, these pastures were intensively and widely exploited according to the directives of the regime. On these pastures, more than 20 thousand head of big animals and 90 thousand small animals were maintained.

3 Adaptation of Mountain Herders to Change

There are differences in the means of exploitation of pastures and their management between the Western and Eastern Pamirs, which are to be highlighted here. In the eastern part of the Pamirs the herders spend the summer in permanent buildings made of stone and called *el*. It is a Pamiri term, which means *kashar* in Tajik or *jaylo* in Kirghiz, basically the place where herders keep their livestock in the summer pasture during their stay there. The existence of these small summer camping-type dwellings more or less indicate where the pastures are located and can indicate a loss of importance as the people abandon a pasture and its *el*.

The *el* is used as a base for the production and maintenance of milk products to be produced in the course of the summer season. For this reason considerable efforts are spent in the labour process. During summers, women and children often live with the herder in the *el*. In Saghridasht in the western part of the GBAO, in contrast, the herder would spend the summer in a tent without his family. Although this may significantly increase the freedom of movement, it appears to imply that milk products must be processed by the shepherd himself for the whole of the summer. This could perhaps explain why in some cases milking cows are not driven to the summer pastures and instead form herds

that remain on the grazing grounds in the vicinity of the village. These animals then inflict considerable damage on the pastures. In the Eastern Pamirs, those who send their animals to the pastures do not always receive the benefit of any milk products for the duration of the season. Most frequently, these milk products help to form a part of the payment of the shepherd.



Photo 3: Kirghiz yurt in the Eastern Pamirs of Murghab District
(photograph © Hermann Kreutzmann August 28, 2001)

Also, in the Eastern Pamirs, the local herders (chiefly the Kirghiz) use yurts (*chailoq*). These are convenient dwellings for a nomadic lifestyle, and moveable from one place to another (Photo 2). The other herders of the region should use this method. This method is also appropriate for the herders from western and other parts, whose livelihood depends on livestock development. The local herders have the experience of training yaks in order to use them as beasts of burden for transporting loads.

4 Recommendations

1. The low level of the productivity of pastoral lands is shaping an acute deficit of products of the field and requires a profound investigation of the state of the pasture territories and a search for effective ways of strengthening the fodder base.
2. Naturally, pastures for hay are very different from cultivated pastures in respect of their biological and economic productivity. Hence, the necessity

of providing animals with seasonal-pasture fodder is required. Intensive exploitation of remote pastures would lead to the preservation of winter pastures. The priority tasks at present are the rational exploitation of the seasonal pastures and superficial improvements of the hay meadows and the pastures of the region.

3. To conduct research on climate change on the high-altitude zones of the Pamirs.
4. To identify new and early ripening and frost-resistant kinds of fodder crops through conducting research and establishing demonstration and experimental plots together with research institutes that focus on the high altitude zone of the Pamirs.
5. To observe the rules and regulations of the management of pastoral land assets and prevent the process of degradation of *teresken* pasture lands in the Eastern Pamirs.
6. To design a method of restoration of *teresken* pastures and their incorporation into sustainable process of production.
7. To provide scientifically proven recommendations for the break-up of regions and areas with consideration for their biological peculiarities and climatic conditions.

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»»» 6 Achievements and Visions of Agricultural and Pastoral Development in the Tibet Autonomous Region

Zhang Younian⁵⁷

Distinguished experts, ladies and gentlemen, according to the agenda of this workshop, I am presenting to you, delegates of this workshop, a report on the Achievements and Visions of Agricultural and Pastoral Development in the Tibet Autonomous Region, outlining the accomplishments, challenges and opportunities, development strategies and solutions in the agricultural and pastoral sector.

Tibet Autonomous Region is located in the south of the Tibetan Plateau, covering a total area of 120 km², or about 1/8 of the national territory. It has seven prefectures (cities) and 73 counties (cities/ districts) under its jurisdiction. In addition to Tibetans, there are peoples of Moinba, Lhoba, Hui, Naxi and the Sherpa tribe. The Region has 45 ethnic groups in total, including the Han. In 2009, the population of TAR is 2.9 million, of which 23.8% is urban population and 76.2% rural. The total area of agricultural land is 1.16 billion *mu* (15 *mu* equals one hectare), of which 970 million *mu* is rangeland, 190 million *mu* forest 5.4 million *mu* cultivated land, and 1.8 *mu* others.

57 Deputy Secretary-General, Tibet Autonomous Region People's Government

1 Main Achievements and Lessons learned in agricultural and pastoral Development

1.1 Development achievements

To speed up development in Tibet, five Working Conferences on Tibet have been held by the central authorities since the beginning of reform and opening up. Under the competent leadership of the CPC Central Committee and with the strong support of the entire Chinese people, the Tibet Autonomous Region has always prioritized issues related to farmers, the agricultural sector and the rural areas, improving production and living conditions for farmers and herdsmen and sparing no efforts to increase the farmers' income. By emancipating our minds, deepening reform and doing earnest and solid work, we have achieved rapid and sound development of the economy in the agricultural and pastoral areas, bringing to the people the tangible benefits of development.

1. Farmers' income has maintained double-digit growth for seven consecutive years, consistently raising the living standards of farmers and herdsmen

To further implement the central authorities' strategy of "prioritizing betterment of production and living conditions for farmers and herdsmen and increasing farmers' income in the economic and social development of Tibet", the TAR party committee and government have made timely assessment of the situation in the agricultural and pastoral areas. We have shifted our focus from just increasing grain yields to increasing the income of farmers and herdsmen. For several years we have held special meetings and sessions to discuss the right way to help people generate more income. We have adopted a number of measures to increase farmer income, including income generation through the input of policies, investment, industrialization, employment and reforms. These measures have been taking effect, forming a wide range of solutions for farmers and herdsmen to generate more income. In 2009, the per capita net income of farmers and herdsmen reached 3,532 Yuan, which represents a 1.5 times increase over that of 2000. The living standards of farmers and herdsmen have been improved, with cars, motorcycles, washing machines, refrigerators, televisions, mobile phones and other high-quality consumer durables gradually entering into the average household.

2. Food production has been stable and sustained at a level of 920,000 tons per year, with a more optimized cropping structure.

Through constant efforts to enhance the per-unit yield of grains and edible oil, we have improved the per-unit grain yield by more than 78 kg compared with

the figure of 2000. We achieved basic self-sufficiency in meat, grain and edible oil in 2000. Since then, we have been, on one hand, ensuring the stability of grain supply, and on the other, adjusting the structure of crops to generate more income for the people. According to local conditions, we have been actively developing cash and forage crops. With grain production maintained in a stable manner, the planting structure has also been adjusted and optimized. 2009 saw a total grain output in TAR reaching 905,300 tons, the total output of rapeseeds six million tons, up 50% compared to 2000, and vegetable output at 551,100 tons, an increase of 164% compared to 2000. The vegetable self-sufficiency rate in summer and fall in the urban area was 80%, with more than 110 plant varieties. We have effectively enhanced the quality and standard of TAR's food basket.

3. Rangeland ecological and environmental protection has made new progress and production capacity for main livestock products has reached a higher level.

According to the characteristics of Tibet's natural environment and rangeland resources, the TAR government has formulated the guiding principles for rangeland management, i.e. "comprehensive protection, rational use and concentration of resources on key projects". We have focused mainly on fencing, soil improvement, reseeding, irrigation, fertilization, pest control, elimination of poisonous weeds and other work related to the comprehensive management of natural rangelands. We have made solid progress on rangeland restoration, pastoralist resettlement and other major development projects. Since 2004, about 3273 *mu* of rangelands have been restored, with the project area's vegetation coverage increased to more than 55% and fodder yield up by 25–30%. The grass production capacity of these rangelands has been effectively restored. We have adhered to the development and restructuring of pastoralism, especially pastoralism in farming areas, creating an increasingly integrated pastoral and agricultural development model. Livestock-raising is now seeing a strong momentum in the rural and suburban areas. The process of rangeland livestock breeding shows new changes. Meat output in 2009 in TAR reached 25 million tons, an increase of 63% over 2000. Milk output amounted 30 million tons, up 45% compared to 2000. The poultry and milk sectors have accelerated the pace of development, with the self-sufficiency rate improving significantly. Prevention and control of animal epidemics continue to improve. We have built the necessary infrastructure, enhanced the overall prevention and control capabilities to protect the safety and quality of pastoral products, and maintained the healthy development of pastoralism.

4. The emergence of industrial and commercial activities in the agricultural area has seen the output value of township enterprises surging and a significant increase in income generation of a variety of sources.

We have supported the strong development of leading enterprises and accelerated the industrialization of agriculture so that both agriculture and pastoralism can achieve the leapfrog development. These measures have played an important part in increasing farmer income. By guiding the focus of township enterprises toward agricultural industrialization and by supporting their processing capacity of agricultural and livestock products, we have seen the rise of a number of leading enterprises with good development prospects and strong competitiveness. In 2009, the region's total output value of township enterprises reached 3.15 billion Yuan, and non-agricultural revenues four billion Yuan, an increase of 2.9 times and 3.5 times respectively, compared with 2000. We have supported and nurtured thirteen regional-level leading enterprises for agricultural industrialization, of which seven are key state enterprises, and nearly 50 prefecture-level leading enterprises. Agricultural and pastoral areas have embraced the rapid development of professional and cooperative organizations. Mechanisms leading to enterprise innovation and market development have developed quickly.

5. Intensified training of farmers and herdsmen has brought about positive changes in employment structure

Faced with the new situation and new tasks, the TAR party committee and government have identified capacity building of farmers and herdsmen and enhancement of their job skills as the most important tasks for socio-economic development in the agricultural and pastoral areas. Since 2006, a total of more than 250 million Yuan of funds have been earmarked for training of farmers and herdsmen. With the improvement of their employability and skills, the farmers and herdsmen have secured more employment and additional income sources and expanded the sub-sector division of labour in the agricultural and pastoral sectors. According to recent statistics, the ratio of rural labour force engaged in traditional agriculture, forestry, pastoralism and fishery dropped from 89.4% in 2000 to the current 78%. Labour export has become the main source of cash income, with labour income of the Region in 2009 totalling 1.27 billion Yuan, 2.9 times more than that of 2000.

6. We have accelerated the pace of building the new countryside and significantly improved the looks of the rural area.

Since 2006, the TAR party committee and government have made the housing projects in the pastoral area a starting point of building the new countryside. We have spared no efforts to promote the pastoralist resettlement programme, which also involves poverty alleviation and reconstruction of rural housing, greatly improving the living and housing conditions for farmers and pastoralists. By the end of 2009, a total 230,000 households of 1.2 million farmers and herdsmen have moved into their new and more comfortable houses. At the same time, we have strengthened construction of supporting facilities in these housing projects, putting in place an integrated network of water, electricity, roads, telecommunications, gas, etc. The rural landscape is moving from local improvement to overall advancement. The past ten years have witnessed 85% of the masses getting safe drinking water, 114,000 households using biogas and 395,000 farmers and herdsmen families being provided with solar cookers by the government. All towns and 80% of villages have become accessible by road. 70% of the population in agricultural and pastoral areas has access to electricity. 85% of villages are connected by phone lines and 80% of towns by post. We have basically realized the development goals of “cable to the county and telephone/fax to the town”.

7. Solid progress has been made in poverty alleviation and poverty rate has been greatly reduced.

The TAR party committee and government’s strategy of reducing poverty by development has targeted the enhancement of the poor people’s development ability. We have consistently increased investment in poverty alleviation and development, building more safe houses for poor or relocated families and evacuating people from places infected by epidemics. We have promoted poverty reduction by targeting the entire towns, developing niche industries, and advancing science and technology. With a variety of poverty alleviation projects functioning, we have seen poverty declining and people’s capacity for development growing. Through years of unremitting efforts, the key poverty population in Tibet has decreased from 1.48 million in 2001 to 203,000 at the end of 2009. The number of rural poor and low-income population has declined sharply, effectively promoting harmony, stability and betterment of living and working conditions in agricultural and pastoral areas.

1.2 Main practices and experiences

Review of the economic development process of Tibet's agricultural and pastoral areas has made it clear that such tremendous achievements are only possible with following the guiding principle of socialism with Chinese characteristics. They are only possible with the competent leadership of the central government and selfless assistance of the Chinese people across the country. They are only possible with the campaign of reform and opening up to the outside world. And they are only possible with the concerted efforts and enthusiasm of the leaders, entrepreneurs, farmers and pastoralists in TAR. Our main practices and experiences are as follows:

1. Strengthening policy guidance and creating a favourable environment is an important guarantee for rapid development in the agricultural and pastoral sectors.

In 2001, the Fourth Working Conference on Tibet by the central government clarified and improved the party's policy for promoting agricultural and pastoral economies in Tibet. A series of enabling policies were introduced, together with the assurance of the long-term consistency of policies on cultivated land, rangeland and livestock. The central authorities have formulated the strategic plan "to improve living and working conditions of farmers and herdsmen and increase farmer income". "This is the primary mission of economic and social development of Tibet". The work related to farmers, agriculture, and the rural areas has been given strong support in the human, financial, and material aspects. Since 2005, the earmarked funds for subsidizing agricultural goods, crop varieties, food, fuel, livestock breeding and other special funds has reached 1.3 billion Yuan per year. With the guidance and stimulation of the various preferential policies, farmers and herdsmen have demonstrated unprecedented enthusiasm in the agricultural production activities, to get out of poverty and become rich. Productivity in agricultural and pastoral areas has seen further emancipation and development, laying a solid foundation for accelerated economic development in agriculture and pastoralism.

2. Increasing capital investment and strengthening project management forms the important foundation to realize rapid development in agriculture and pastoralism.

Since 2001, the central government has made a total investment of more than ten billion Yuan in Tibetan agriculture and pastoralism. It has implemented some hefty development projects such as the pastoralist resettlement programme, the rangeland restoration programme, the high-quality grain and oil production

base, and the niche agricultural and pastoral industries. Especially since the beginning of the “Eleventh-Five-Year-plan” period, the relevant ministries of the State Council has increased their support for infrastructure building in agriculture and pastoralism, giving a strong impetus to the rapid development of agricultural and pastoral economies. Infrastructure projects for agriculture and pastoralism have attracted more investment, bringing effective improvement of the production and living conditions of farmers and herdsmen. These projects have played a major role in promoting the continued enhancement of productivity and output in agriculture and pastoralism.

3. Focus on technological innovation and outreach provides an important support for rapid development in agriculture and pastoralism.

In recent years, the TAR government has always adhered to the principles of “combining technological import with indigenous innovation, prioritizing development in key areas, reinforcing basic scientific research, and supporting the development of value chain”. We have focused on practicality of agricultural and pastoral technologies, strengthened the integrated applications of scientific and technological achievements, and put a special emphasis on the application and new outreach technologies, varieties and equipment, giving a powerful boost to technological advancement in agriculture and pastoralism. Contribution rate of science and technology to agricultural and pastoral output grew from 25% in 2000 to 36% in 2009. Coverage of improved crops in the region rose by more than 80%. We have vigorously promoted agricultural mechanization, with the combined engine power of agricultural machinery reaching 3.5 million kilowatts. The area using mechanical ploughing, sowing and harvesting amounted to two million *mu*, 1.97 million *mu*, and 1.68 million *mu* respectively, increasing 46%, 20.8% and 2.3 folds over 2000. We have promoted technological innovation in livestock breeding, with the main livestock productivity and quality growing steadily. We have made an effective start in agricultural standardization. As of 2009, 23 local standards for crops have been developed and 19 pollution-free agricultural production bases have been certified. In total, 129 pollution-free, green or organic agricultural products have been certified. Technological progress and innovation has stimulated transformation of the agricultural growth pattern. More productive varieties of barley and breeds of yak have been successfully developed, opening up a broader market space for niche agricultural and pastoral industries and raised added value in processing for agricultural and livestock products increased as well their quality and safety standards.

4. Taking advantage of local resources to promote structural adjustment is an important way to improve quality and efficiency in the agricultural and pastoral sector.

Market economy has put new requirements to development of agriculture and pastoralism. Moreover, there are increasing demands for increase of productivity in agriculture and pastoralism and raise of income for farmers and herdsmen. Therefore, since 2004, the TAR government has followed the concept of “giving priority development to projects with advantageous locations, superior resources and competitive industries, priority development”. In accordance with the requirements of “regional concentration, scale expansion, quality improvement and efficiency enhancement”, capital has been consolidated to focus on the implementation of the development projects of niche products in agriculture and pastoralism. We have seen the initial formation of the Cashmere goat industry in the Northwest of Tibet, the yak industry along the Qinghai-Tibet Railway, the food industry with poultry, eggs, milk and vegetables in the central valleys of the Brahmaputra and its tributaries of Lhasa River and Nianchu River and the forest-based industry of eastern Tibet. In agriculture and pastoralism, a pattern of regional distribution, professional production and intensive management, featured development is coming of age, effectively promoting the increase of farmer income. According to incomplete statistics, from 2004 to 2009, about 3,000 industrial projects in agriculture and pastoralism had been implemented, benefiting more than 900,000 farmers and pastoralists. The project area has achieved an increase of per capita income of more than 600 Yuan.

5. Steadily promoting reform and innovating development institutions creates a source of vigour and vitality for the development of agriculture and pastoralism.

On the basis the long-term consistency of agricultural and pastoral policies, we have actively explored the institutions of unified and separate management and given birth to new organization structures and business models that have the features of professional cooperation and are in sync with agricultural and pastoral practices. About 290 professional and cooperative organisations have been established in the Region. We have steadily implemented the rangeland contract responsibility system, clarifying the relations between responsibilities, rights and benefits of rangeland management and its protection, utilization and restoration. We have promoted the balance between livestock and rangelands, mobilizing the masses to protect, restore and rationally use rangeland resources. The continuous progress of reform in agricultural and pastoral areas has ef-

fectively addressed some of the deep-rooted problems that restrict agricultural and pastoral productivity, stimulate the further development of these sectors.

2 Challenges and Opportunities in agricultural and pastoral Development

2.1 Challenges in agricultural and pastoral development

At present, work related to farmers, agriculture and the rural area has entered a new period of development. Tibet has made significant progress in agricultural and pastoral development. Both production capacity and farmer income levels have achieved a historic breakthrough. However, compared with modern agriculture and pastoralism in the more developed provinces, we still face many problems and difficulties in agricultural and pastoral development, and the gap is obvious. Overall, agriculture and pastoralism in Tibet are still in the foundation-laying stage in transitioning from traditional farming and nomadism to modern agriculture and pastoralism. The main challenges are as follows. First, there is a gap between our current production capacity and that of modern agriculture and pastoralism. Second, there is a gap between our current scientific and technological capacity and that of modern agriculture and pastoralism. Third, there is a gap between our current market process and that of modern agriculture and pastoralism. Fourth, there is a gap between our current organization capacity of farmers and herdsmen and that of modern agriculture and pastoralism. Fifth, there is a gap between the current skill level of farmers and herdsmen and that of modern agriculture and pastoralism. In short, we still face some crucial and uphill battles and have the historic task to accelerate development and narrow the gap with the developed provinces. Therefore, the main tasks and historical missions in agriculture and pastoralism include transitioning from traditional to modern farming and pastoralism, achieving a substantial increase in farmer income, and striving to enter a fairly well-off society by 2020 together with the rest of China.

2.2 Opportunities in agricultural and pastoral development

1. We face unprecedented opportunities in agricultural and pastoral development. The special status for Tibet has brought with it all kinds of support and preferential treatment. The central government has held five Working Conferences on Tibet, putting forward a series of preferential policies and support measures. Early this year, when the Fifth Working Conference on Tibet was held, the central authorities set out some ambitious goals for Tibet. By 2015, the gap between the per capita net income of Tibetan farmers and herdsmen and the national average is to be significantly reduced, with basic public services

much improved, the ecological environment better conserved and the living and working conditions of farmers and herdsmen enhanced. With the issuance the No. 4 Document by the CPC Central Committee and No. 42 Notice by the Office of the State Council, Tibet faces some unprecedented development opportunities in agriculture and pastoralism. Based on the local realities, Tibet Autonomous Region Party Committee has laid out our strategy for economic development, specifically increasing the production capacity of the primary industry, focusing on key projects in the second industry and supporting all developments of the third industry. With this strategy, the future directions of agricultural and pastoral development are clearly pointed out. Meanwhile, the completion of the Qinghai-Tibet railway and a large number of infrastructure projects has resolved the traffic bottleneck that restricts economic and social development of Tibet, expanding marketing channels for agricultural and livestock products, strengthening Tibet's communication and cooperation with the outside world and bringing more opportunities for development in agriculture and pastoralism.

2. We have consolidated the basis for agricultural development. After years of exploration and practice, Tibetans have developed some clear ideas and concepts on agriculture and pastoralism. More solid and effective measures ensure that agriculture and pastoralism will not deviate from the correct course of development. Through years of investment, infrastructure in agricultural and pastoral areas has been greatly improved, enhancing the comprehensive production capacity of agriculture and pastoralism and the ability to resist natural disasters. We have laid a good foundation for the modernization of agriculture and pastoralism. Accelerated pace of technological innovation and continuous increase of farmer income has added vitality and vigour to the extraordinary development of agriculture and pastoralism in Tibet. Meanwhile, the historical process of building the new socialist countryside and the mighty tide of market economy has stimulated liberation of thought on the part of farmers and herdsmen. Profound changes have taken place in people's mindsets and in their awareness of market competition, income generation opportunities and facilitation of science and technology. It will stimulate and motivate farmers and herdsmen's enthusiasm for agricultural and pastoral development.

3. We have the advantages of unique natural resources. Tibet has abundant natural resources for agricultural and pastoral development. Tibet is crisscrossed by rivers, lakes and rolling glaciers, creating abundant water resources. It is known as the "Source of Rivers" and "Water Tower of Asia". It ranks at the top of the country in terms of per-capita, accumulative and per-unit ownership of water resources, providing effective guarantee of water resources for agriculture

and pastoralism. It has excellent light and heat resources. Statistics show that the average annual solar radiation in Tibet totals 6000 to 8000 total MJ/m², with the annual sunshine hours up to 3400 hours. Long sunshine hours, strong radiation and temperature difference between day and night create a climate that is conducive to formation and accumulation of crop nutrients such as protein. Meanwhile, in Tibet, there is a large proportion of low-yield farmland and large areas of wasted shoals and slopes available for exploitation, creating huge potential for agricultural and pastoral development.

4. Agricultural and livestock products in Tibet has distinctive characteristics and development potential. Tibet's unique atmosphere, water, soil and other environmental conditions give birth to unique and distinctive agricultural and livestock products, such as barley, yak, etc. They have not only good value as a food source, but also high medical and health care benefits. Tibet's unique geographical environment and the limited existence of industrial and mining enterprises means very little pollution in the atmosphere, water and soil. This makes Tibet a superb location for the development of organic or green foods. The natural agricultural and livestock products produced in Tibet are born with a "clean" label and have great potential for development.

3 The general Strategies and Solutions for agricultural and pastoral Development

Agriculture and pastoralism are the primary industry of the Tibetan economy. According to statistics at the end of 2009, the primary industry accounted for 14.5% of the GDP of Tibet, with the population of farmers and herdsmen accounting for nearly 80% of the total. The agricultural and pastoral communities occupy 90% of the total land area of Tibet. Therefore, we feel the urgent need to accelerate agricultural and pastoral development, effectively increase the farmers' income, speed up the construction of the new socialist countryside, and ensure Tibet's long-term economic prosperity and social stability.

3.1 The Master Development Strategy

We shall follow the spirit of the 17th CPC National Congress, thoroughly implement the concept of sustainable development in accordance with "Chinese and Tibetan characteristics". We shall focus on the main line of building an important base for niche agricultural products and national ecological shelter and the new socialist countryside. On basis of guaranteeing food security, we shall highlight the improvement of production and living conditions of farmers and herdsmen and increase of farmers' income as the primary task. We shall push forward infrastructure building and development of niche industries. We

shall promote the intensive use of factors of production, technological means of production, industrial management integration and farmer income diversification, so as to achieve better, faster, greater development in agriculture and pastoralism.

3.2 Development Solutions

1. We shall deepen the rural reform and implement the preferential agricultural policies.

We shall continue to uphold and improve the consistency of agricultural and pastoral policies. We shall implement the most stringent farmland and rangeland protection system and encourage trading and proper circulation of the right to use arable land and rangeland. We shall actively support the development of large-scale family ranches, and explore market-oriented mechanisms for large-scale production and management in agriculture and pastoralism. We shall further implement subsidy of grains, seeds and agricultural machinery, and other preferential policies. We shall actively explore organisational structures that can increase productivity and income of the agricultural and pastoral areas and encourage farmers and herders, on basis of free will, equality and mutual benefit, to establish private professional associations of various forms. Trade in agricultural and pastoral areas shall be encouraged, with establishment of brokerages and street markets and material exchanges to support the match-up of production and sales. We shall take various measures to reform the investment management system that is directly related to interests of farmers and pastoralists and gradually establish a stable and long-term mechanism for income generation and a relative sound social security system.

2. We shall strengthen infrastructure construction and improve production capacity.

We shall seize the opportunity of increasing investment going to the agricultural and pastoral sectors of Tibet from the central government and other provinces. We shall actively seek credit and social funds to invest in agriculture and pastoralism, and gradually establish diversified channels of investment and financing, strengthening the financial basis for development in agriculture and pastoralism. We shall focus on building the most urgent infrastructure that relates to the biggest concern of the farmers and herdsman and can benefit the majority of them. We shall further adjust the investment direction and priorities to maximize increase of farmer income, improve their production and living conditions, upgrade the comprehensive production capacity, and

transform the economic development pattern by promoting niche agriculture and pastoralism. Prominence shall be given to projects related to improvement of production and living conditions, rangeland ecological protection, technological innovation and systemic enhancement. We shall strengthen project management of infrastructure building and attach greater importance to post-project management. Through a clear business ownership and management structure, we shall improve post-project management and operational mechanisms to ensure that projects produce lasting benefits.

3. We shall strengthen scientific and technological innovation and support the development of agricultural science and technology.

We shall adhere to the principles of “combining technological import with indigenous innovation, prioritizing development in key areas, reinforcing basic scientific research, and supporting the development of value chain” and highlight local features, practical applications, commercialization of research results and technical services to pastoral and agricultural communities. We shall provide scientific and technological support to the agricultural and pastoral industry with a focus on improving its production capacity. We shall give prominence to breeding new varieties of crops and livestock, improve the quality and productivity of grain and oil crops, promote large-scale livestock farming, encourage value-added features in agricultural products, set up a standardization system, conserve the agro-ecological environment, and step up prevention and control of pests and major animal diseases and other technology operations. We shall strengthen the agricultural extension service system, building strong teams and improve conditions, means and efficiency of service. We shall deepen reform in the science and technology promotion system and adhere to the principle of “strengthening public interest and flexibility in operation”. We shall explore the combination of free and paid services, connecting pay with the quality of service and putting reward and punishment in place. We shall greatly enhance the science and technology promotion effectiveness and promote the use of technology in agriculture and pastoralism to improve efficiency, increase income of farmers and herdsmen and enhance the competitiveness of agricultural and livestock products.

4. We shall strengthen the training of farmers and herdsmen and improve the scientific and cultural education of farmers and herdsmen.

We shall establish and improve the farmer education and training system, taking comprehensive action to promote training of young farmers. We shall integrate various resources to promote market-oriented project-based vocational

education of farmers and pastoralists through various formats. To stimulate employment and increase income, we shall carry out training of various skills and scientific education in a planned, organized and target manner. Our objective is to cultivate morality, culture, understanding of technology and business management in the hard-working farmers and pastoralists so that they get out of poverty with their newly acquired skills and capacities.

5. We shall strengthen the development of niche industries and enhance our competitive advantage.

We shall focus on nurturing the development of leading enterprises in the process of agricultural industrialization. By attracting leading enterprises with preferential policies and active markets and encouraging them to accelerate technological upgrade, we shall establish clusters of successful enterprises that meet the requirements of the market economy and have strong competitive strength and brand power. We shall encourage agro-enterprises to participate in the various links of production, management, processing, and circulation so they can be the catalyst of development in agriculture and pastoralism and play a good role model in the transition toward modern agriculture and pastoralism. We shall prioritize development of niche agricultural and pastoral products. According to the requirements of “regional focus, expansion of scale, quality improvement, efficiency enhancement”, we shall highlight three tasks in development of agriculture and pastoralism. First, we shall go big, and create industrial clusters. While upholding family-run businesses, we shall focus on building industrial clusters, with concentration of regional resources, major industry leaders and other production factors. Our priorities shall be on industrial clusters for high-quality barley, goat, yak, and Tibetan sheep. Second, we shall go deep, and promote value-added businesses. We shall strive for a breakthrough in value-added processing of fruits and vegetables, milk, meat, skin, wool, Cashmere, Tibetan medicine, beverages, and feeds, and form a more complete value chain. Third, we shall go strong, and support brand building. By standardizing production processes and strengthening management and marketing, we shall foster a number of reputable enterprises with prominent brands. They shall have strong market share, potential for value-added business and the power to increase farmer income.

6. We shall strengthen pro-poor development and improve capacity for self-development.

We shall concentrate on poverty reduction for people whose per-capita annual net income is less than 1,700 Yuan. We shall proceed by lifting a whole town

out of poverty and promote the anti-poverty work in the border areas, minority areas with small populations and areas with harsh natural conditions. We shall spare efforts to improve the production and living conditions for low-income population, and accelerate their pace to get rich. Specifically, we shall focus on eight tasks. We shall complete the housing projects for 22,000 poor farmers and herdsmen. We shall promote poverty alleviation for 200 rural villages and towns. We shall focus on supporting the 206 border villages, minority villages with small populations. We shall build more small-scale water conservancy projects in remote villages and improve the village infrastructure such as transportation. We shall continue to support industrial projects aimed at poverty alleviation. And we shall develop more niche products with local characteristics, set up cooperative organizations or associations, and increase farmer income by labour export and other means.

7. We shall make rational use of agricultural resources and improve the capacity of ecological restoration.

We shall implement projects for the conservation and utilization of agricultural and biological resources and carry out protection of crops, livestock and aquatic animal and plant resources in Tibet. We shall sort out, identify and conserve the agricultural germplasm resources. We shall strengthen protection of rangeland resources as the main content of our ecological and environmental protection campaign. To deal with overgrazing and the degradation, desertification and salinization of rangelands, we shall strengthen law enforcement and supervision. To maintain the balance between livestock and rangelands, we shall increase livestock slaughtering, provide more incentives for rangeland ecological protection, and strengthen rangeland restoration and other major conservation projects. We shall enhance rangeland resource monitoring and establish an early warning system of ecological environment. We shall promote conservation-oriented tillage techniques, control soil erosion and degradation and ensure sustainable development of agriculture and pastoralism. We shall vigorously develop new energy sources in rural areas, and actively promote the use of biogas technology. We shall popularize efficient water-saving agricultural technology and other technologies for ecological protection and pollution monitoring to realize balanced development between pastoralism and resources, as well as population and environment.

8. We shall strengthen team building and improve service capabilities.

Relying on existing conditions, we shall integrate existing scientific and technological resources, attract more talents and step up talents training, putting an

emphasis on introduction and training of high-level management, professional and technical personnel. We shall further streamline the working relationship and strengthen the agricultural and pastoral management and service network at the level of the autonomous region, prefecture, county, and township. We shall transform the functions of the government agency to better serve farmers and pastoralists, and create a good environment for economic development and effectively improve government service.

4 Final Remarks

Experts, ladies and gentlemen, development of agriculture and pastoralism in Tibet still has a long way to go. Not only do we need the strong support from the central government, but we also rely on the selfless and enthusiastic assistance from people across the country. More importantly, we need both domestic and international experts and scholars for their advice and suggestions and active participation. We sincerely hope that all the experts, scholars and friends at the workshop will support the development of agriculture and pastoralism in Tibet, and actively participate in the related scientific and technological researches. Let us join hands and make our due contributions to the sustainable modernization of agriculture and pastoralism in Tibet.

» » » 7 Panel and Group Discussions

7.1 Summary of Panel Discussion on Functions and Values of Pastoralism and Rangeland Management

Nyima Tashi, the vice president of Tibetan Academy for Agricultural and Animal Science, hosted this workshop as its chairman. Firstly, seven specialists who had given presentations earlier in the day introduced themselves briefly, providing information on their backgrounds, fields of research and experience. The specialists included Dr. Yang Yongping, Dr. Yi Shaoliang, Prof. Dr. Hermann Kreutzmann, Mr. Izhar Ali Hunzai, Mr. Uday Chandra Thakur, Prof. Danba and Mr. Liu Jianli.

Following the introduction, the chairman shifted the topic to the functions and values of rangeland and requested each specialist to speak about two functions which they think are important. Dr. Yang Yongping said that the rangelands can provide a habitat for biodiversity and protect water resources. Dr. Yi Shaoliang gave two functions: livestock production and environmental protection. Prof. Dr. Hermann Kreutzmann spoke out about ecological stability and human adaptation. Mr. Izhar Ali Hunzai explained the functions as relating to the survival of human beings and traditional cultures. Mr. Uday Chandra Thakur pointed out the functions of organic farming and traditional knowledge transmission. Prof. Danba understood the functions from his experience, and included the basic factors for production of the caterpillar fungus and regulation of the climate. Mr. Liu Jianli thought the functions of rangelands in Xinjiang Province included storing water, stabilising soil and preventing sand storms.

After a summary of all of functions of rangelands by the chairman, the discussion was continued and each specialist was asked to list the two main values of

rangelands in their opinion. The order of specialists was reversed. Mr. Liu Jianli highlighted the ecological values and productivity of rangelands. Prof. Danba elaborated by focusing on the improvement of standards of living and the environment. Mr. Uday Chandra Thakur said that the rangelands can be used for tourism and marsh protection. Mr. Izhar Ali Hunzai said the rangelands can supply new energy and abundant resources. Prof. Dr. Hermann Kreutzmann pointed out that the rangelands can purify the water and air. Dr. Yi Shaoliang explained the value in terms of food production and traditional culture. Dr. Yang Yongping thought the largest value of rangeland was its role as an archive of human knowledge and as carbon storage. Finally, Mr. Mainali Gopi Nath added another value of rangelands, to maintain biodiversity of unique flora and fauna.

Then, Dr. Nyima Tashi pushed the discussion forward to another question of how to balance the ecological and economic values in order to achieve the sustainable development of rangelands.

Specialists were allowed to express themselves freely for three minutes. Prof. Dr. Hermann Kreutzmann thought the economic value of rangelands should be appreciated and utilised based on the conservation of natural resources and the protection of traditional knowledge. Dr. Yang Yongping answered this question with three points. Firstly, he considered that scientific research on the product function of rangelands should be enhanced. Then, all herders should join in the management of the rangelands. Lastly, the policymakers should consider the scientific research and herders' benefits simultaneously. Mr. Izhar Ali Hunzai took an example from his experience to explain his opinion that one should consider and serve the requirements of urban consumers in tune with the accessibility and availability of niche resources of rangelands in order to utilize the dominant resources and bring benefits to the herders. Mr. Uday Chandra Thakur argued that the enhancement of the capabilities of the herders was the most important factor in the sustainable development of rangelands. Dr. Yi Shaoliang resolved this problem with three steps: understand the ecosystem, culture and knowledge of the rangelands; become familiar with the changes of all factors and encourage the local people to join in the management of the rangelands. Prof. Danba analyzed this issue with four suggestions: increase the utility of fences and management; import new strains of pasture grasses; enlarge the area of rangelands and improve the protection consciousness of herders. Mr. Liu Jianli expounded his opinion with three suggestions. Firstly, managers of rangelands should enhance protection. He recommended that they carry out a fallow policy and prevent overgrazing instead of providing financial subsidies. Secondly, the producers should better publicize the functions of

rangelands, improve the production capacity and change the structures and species of the livestock. Lastly, the researchers should provide support scientifically and with technology. Finally, Mr. Narendra Lama added that protection should be considered with the herders. Policies should combine with resources protection, and some tourism projects could be attempted that have a small scope but a high value.

Next, the topic shifted to the impact of climate and global change and how to deal with both changes. Dr. Yi Shaoliang said human beings should reduce disturbances to the ecology and adapt to it actively. Prof. Dr. Hermann Kreutzmann thought global change was more important than climate change. Although global change brought many challenges, more opportunities also exist if we can use and discover more special resources of the rangelands. Mr. Izhar Ali Hunzai said the global change required everyone to participate and bring more opportunities to the local people, but that the local consumption had to change to a certain extent. Mr. Uday Chandra Thakur thought the local people should be empowered to deal with global change. Prof. Danba expressed the thought that climate and global change could be positive, and that he hoped the climate change could bring improvements. Lastly, Mr. Liu Jianli introduced the recent changes in Xinjiang, including the reduction of rainfall and the decrease of plant species. Taking this change into account he believed that pastoralism still had a strong competitive capability because of its low cost of production and its organic products.

Finally, representatives from the plenary asked a few questions of the five specialists who gave presentations prior and the specialists responded.

1. Q: How can we control the harvesting of caterpillar fungus and are the government strategies useful? If possible, could you please give us some examples of these strategies?

A: The strategies of the government were useful to a certain extent. For example, by introducing training from Tibetan and Han Chinese teachers on the knowledge of caterpillar fungus, most herders can understand the importance of the caterpillar fungus and control themselves in order to protect the resource.

2. Q: Is there any method that could deal with the shortage of fodder in the future?

A: We should enhance the community with agriculture and utilize the abundant natural resources.

Finally, Dr. Nyima Tashi, on behalf of all representatives, expressed his great thanks to the seven specialists.

Recorded by Wang Li

7.2 Summary of Group Discussion

7.2.1 Recommendations from Group Work

The aim of the discussion in the first group was to provide recommendations on the main options used to cope with challenges from the perspective of the government, research and capability building institutes, development agencies and the private sector. After the discussion, seven recommendations were proposed including: baseline and monitoring, research, training, employment, insurance and incentive, added value production and technical measures. The actions included in each recommendation were:

1. Baseline and monitoring
 - a. Changes in the rangeland ecosystem as a result of changed human use patterns should be closely monitored by research organizations
 - b. The biodiversity conservation should be maintained with the participation of local communities and the national government
 - c. Baseline research should be conducted in order to establish comprehensive monitoring of the livestock population and environmental conditions; process information and make it available for use of decision-makers
 - d. Evaluate the efficiency of current rangeland policy to form a logical rangeland policy
 - e. Complete the rangeland resources survey with “the three S” technology, i.e., remote sensing, GPS and GIS technologies
2. Research
 - a. Adjust the structure of the crop farming, to increase the rate of artificial rangelands and to increase the amount of housed livestock
 - b. Improve the production of forage and increase the added value of rangeland production
 - c. Breed and popularize the grass strain which has the highest drought resistance
 - d. Research the strains which are drought and trampling resistant and plant them on the rangeland
 - e. Research the potential for regional cooperation
3. Training
 - a. The related research institutes should actively provide dissemination of scientific knowledge to herders in connection with the problems

- which worry them, in a way that is consistent with their traditional knowledge of the rangelands
- b. Increase the training provided to herders in livestock feeding and management in order to establish a foundation of sustainable development
 - c. Provide skills training such as driving, cooking, building and computers to herders
 - d. Obtain support from some international agencies in capacity building and technology communications
 - e. The government should conduct a training programme to introduce the importance of biodiversity
 - f. Build up the research capacity through a regional or international agency
4. Employment
 - a. Establish some large factories for processing and marketing of livestock in order to deal with the demand for livestock products;
 - b. The government should make some policies on immigration labour and deal with the employment of pastoralists
 - c. The government should play a positive role in the improvement of employment for the younger generations of pastoralists
 - d. Develop the third industry (e.g. tourism, service) and provide low- or non-interest loans to pastoralists
 5. Insurance and incentives
 - a. Livestock insurance should be provided by the government
 - b. Develop and scale-up a “small herd incentive mechanism” to control pasture use pressure and to ensure herders livelihoods through livestock loss insurance
 6. Added value production
 - a. Sell yak meat in separate parts rather than as a whole in order to increase the added value of production and increase the income coming from yaks
 - b. Guide the herders to adjust the structure of their livestock and to thin out the livestock by eliminating the old, weak and sick
 7. Technical measures
 - a. Inter-government cooperation in yak artificial insemination
 - b. Scale-up tested solar technology
 - c. Sound construction and immigration

Recorded by Yi Shaoliang and Wang Li

»»» 8 Recommendations formulated by the Workshop Participants

The regional workshop addressed the pressing needs to review existing strategies and practices on pastoralism and rangeland management which are challenged by climate and global change. For this purpose a number of experts from academia, development practice and policy making convened in order to exchange experiences, to discuss constraints and opportunities and to formulate recommendations for improved livelihood and community strategies on the Tibetan Plateau.

Participants stressed the necessity to balance the functions and values of rangelands regarding ecological needs and livelihoods of pastoralists. Governmental institutions are expected to play a major role in recognising the ecological value of rangelands and its eco-services delivered to humankind. To reconcile pastoralism and environmental protection, people-centred strategies are required.

The challenges posed by climate and global change require closer regional cooperation of a new dimension.

Based on intensive deliberations and extensive exchange of experiences experts from four affected countries formulated the following recommendations.

Rangeland management:

- Review existing policies and formulate new enabling policies which regulate the access to rangeland resources and reconcile development and conservation; e.g. through compensation for eco-system services provided by pastoralists
- Develop innovative models of locally adapted flexible tenure systems which transfer responsibility to communities

- Design updated rangeland inventories
 - to assess potentials (e.g. carrying capacity, water and soil conservation, renewable energy, carbon sequestration potential) of different types and areas of rangelands
 - for effective pasture management policies
- Foster exchange relations between agricultural production and animal husbandry requirements in order to overcome seasonal bottlenecks in fodder availability (e.g. through local fodder storage facilities)
- Improve and make available insurance mechanisms to mitigate risk exposure and to alleviate stress on pastoralists in times of natural hazards and disaster occurrence
- Establish integrated institutions for appropriate and interdisciplinary rangeland management

Market integration

- Foster the diversification of income sources of pastoralist's household through enhancing niche production and marketing of specialized goods in a sustainable mode
- Improve market transparency (e.g. market information systems) in order to achieve a more equitable sharing of profits
- Set up Public-Private-Partnerships to establish a (national) certification system for animal husbandry products
- Support the development of specialized products and their decentralized processing (e.g. high quality dairy and meat items and livestock by-products)
- Raise awareness amongst affluent consumers for high quality rangeland products that are produced locally under sustainable and environmentally sound conditions in order to initiate willingness to pay premium prices

Human capacity development

- Foster the training of community level specialists who are able to monitor herd size and composition and utilization of resources according to local expertise and professional standards
- Provide skills training to herders in order to access income opportunities beyond livestock sector and / or outside the region (e.g. eco-tourism)
- Invest in human capacity building for integrated rangeland management and adapted strategies in pastoralism

Monitoring

- Improve institutional arrangements to monitor effectiveness, impacts and sustainability of pilot programmes
- Consolidate and disseminate existing knowledge and experiences made in pilot programmes

Regional cooperation

- Establish an international / regional platform for the promotion of knowledge and experiences sharing in rangeland management
- Foster the exchange of germplasm of yak and plant species
- Introduce a strategy for cross-border animal disease control and set-up a mechanism for disease monitoring
- Strengthen regional research programmes focusing on climate change adaptation and mitigation for sustainable pastoralism and rangeland management
- Create awareness among regional decision-makers from neighbouring countries about the impact of climate change on the livelihoods on the Tibetan Plateau

»»» 9 Summary of Workshop and Closing Remarks

Hermann Kreutzmann⁵⁸

The regional workshop on “Pastoralism and Rangeland Management on the Tibetan Plateau in the Context of Climate and Global Change” has been held at an appropriate time and in the right setting. Time-wise it is embedded in a series of conferences held by InWEnt that were devoted in 2010 to recent challenges and constraints in pastoralism and rangeland management. In the same year, ICIMOD organised an international experts’ consultancy on pastoralism and a new scientific journal emerged with the title “Pastoralism”. It seems that the remote and extended rangelands in the high mountain steppes and deserts as well as the alpine pastures have returned to the core of academic and developmental attention when it comes to addressing questions of climate and global change. The Climate Change debate has vividly sensitised us that all regions and habitats are somehow interlinked and interdependent. Some areas on earth are expected to be more affected by global warming than others. Deserts, steppes and especially mountain areas are at the critical edge of the human habitat sphere where significant changes are anticipated in the near future. Nevertheless, these regions have been continuously changing since the end of the last glacial age. That might be another reason that makes it worthwhile to look at these critical areas. Here we find resilient people that are masters in adaptation.

58 Chair of Human Geography, Director of the Centre for Development Studies and Institute of Geographic Sciences, Freie Universitaet Berlin



Photo 1: The Tibetan Plateau a challenging landscape for pastoralists and an unique environment composed of pastures and settlements, arid regions, lakes, vast plateaux and high mountains
(photograph © Hermann Kreutzmann September 12, 2000)

The Tibetan Plateau is a specific case in point for adaptation to extreme living conditions (Photo 1), where great distances need to be covered to utilise valuable pasture resources on a highly elevated plateau. These pastoralists have faced all kinds of challenges in order to make survival possible. Here the second perspective becomes valid. Besides climate change, the challenges posed by history and society need to be considered and assessed. Global change scenarios are part of our daily life. The significant economic development in the PR of China cannot be attributed to domestic modernisation strategies alone. China is embedded in the global economy as a major player. This new role implies that global developments are affecting all layers of society, including pastoralists.

The people on the Tibetan Plateau have a longstanding record as actors, stakeholders and recipients of external interventions in the guise of modernisation and reform. The latest developments are related to the policies of eco-shelter on the Tibetan Plateau. Consequently our workshop focused on two aspects: Pastoralism and rangeland management in relation to the demands of nature protection and modernisation of pastoralists' lifestyles. As these two aspects are strongly interrelated, the general question was raised whether there is a need for a reconciliation between them or how to create a win-win position in order to avoid environmental degradation and to enable pastoralists to pursue a viable strategy of resource utilisation in the context of a prospering society.

Let me emphasize four points in order to summarize the findings and course of this workshop

1. State of the art. In the initial stage of the workshop the concept of eco-shelter was introduced. It highlighted the significant set of measures and packages that have been undertaken within this policy framework. For the participants from neighbouring regions it has been an eye-opening experience to note the substantial level of investments allocated for the implementation of the eco-shelter concept. Immediately the question came up whether ecology stops at national boundaries or whether a trans-boundary effort is required in a globalised world. The second aspect was highlighted in a keynote address focused on broadening the perspective on pastoralism and rangeland management by analysing its relationship to eco-tourism and nature protection. Here the potentials were explored that could be developed for widening the livelihood options. Similarly the potentials for niche production were elaborated on. Here we experienced quite a diverse set of frame conditions. On the one hand, there are valuable niche resources that can be utilised, incorporating the spatial expertise and unique knowledge about useful plants, fungi and minerals by pastoralists. On the other hand, the marketing of these valuable goods along established value chains might attribute only a secondary role to them when it comes to sharing the profit. Consequently there is ample scope for improvements in linking goods from the pastoralists' realm with affluent consumer markets. From an analytical perspective, pastoral practices needed to be categorised in space and time. As a result the significant transformations that are linked to external interventions and socio-political changes could be put into a development perspective. The goals of interventions and modernisation have significantly changed pastoral practices that in themselves are an indicator for transformation and modernisation packages. The interrelationship of agriculture and animal husbandry was explicitly highlighted in the presentation by Director Wang. The role of both sectors, their complementarities and strategic inter-linkages to enhance production potential have resulted in a number of practical measures that still bear additional potential and can be instrumental for the cause of poverty alleviation.



Photo 2: Yak-breeding in Linzhou County, Tibet
(photograph © Hermann Kreutzmann September 6, 2000)

2. Sharing experiences. The general picture and the basic challenges and constraints were illuminated and exemplified in the presentation of case studies. Here the expertise from InWEnt's mountain development programme area was introduced. The number of case studies illustrated the diversity and different experiences that could be shared among scientists, practitioners and policy makers. From the expertise of representatives of the respective institutions in China and Nepal as well as from Pakistan and Tajikistan it became more obvious that the synergies generated by this programme are embedded in people who create a community of knowledge sharing. The case studies ranged from the impact of the eco-shelter concept on the Tibetan Plateau and Xinjiang to experiences with eco-tourism implementation in Nepal to the marketing constraints for niche products in Tibet and Pakistan. The insight into the transformation of pastoral practices in Tajikistan was a good example for a different coping strategy that nevertheless is, in itself, path-dependent development. In contrast to these experiences, Prof. Long provided us with material based on socio-economic indicators that clarifies the changes in pastoral systems on the Tibetan Plateau. Real-life experience was gathered during the field trip to Lake Nam Tso in Dangxiong County. The nexus between pastoralism and eco-tourism became obvious and was augmented by Prof. Guge's presentation, in which he provided information on the growth of tourism in Nam Tso lake area and ideas about the management of tourism there.



Photo 3: Golden yaks in Lhasa
(photograph © Hermann Kreutzmann September 11, 2000)

3. Reconciliation. During our panel discussion in the plenary session, it became obvious that the two aspects of pastoralism (representing the human sphere) and rangeland management (representing the ecological sphere) are strongly interlinked and that probably reconciliation between human demands and nature protection is the synthesis approach that could lead to recommendations. Consequently the working groups emphasized the specific aspects in both spheres and the necessity of identifying them before discussing actions and measures that could contribute to reconciliation processes. It is one of the most significant results of this workshop that we have found a common language to address these issues and to highlight a way forward in our recommendations. Deputy Secretary-General Zhang Younian of TAR's People's Government gave further insight into the aim and pace of modernisation as it is directed and guided by governmental institutions. His presentation proved to be one in which the frame conditions of induced change became transparent and obvious. Reconciliation is in his view a process in which governmental institutions have designed the framework and direct the implementation of plans that contain the perspectives of reducing ecological degradation, improving human welfare and addressing economic necessities as given and backed by higher authorities. Consequently, reconciliation results in modern resource management, optimizing strategies and resettlement of pastoralists in pre-designed and established townships that are supposed to be the future centres of pastoral activities.

4. The way forward and outlook. The good message that was received during the workshop was that after the merger of GTZ and InWEnt the new German institution for international cooperation GIZ will continue the mountain development programme. The achievements so far have been highlighted already on the first day of the workshop. This workshop has shown again that it seems worthwhile to continue on the path taken and to adapt the programme's direction to the pressing issues of our time: climate and global change and their impact on the living conditions of mountain people. To make the achievements available to a broader community of practice and knowledge, InWEnt is publishing the results of this workshop in a book series that has become by now a set of compendia used by a wider readership in their daily routine. To secure knowledge and to safeguard ownership is one goal of this series of books that are also available online. Therefore I would like to use this occasion to call for all contributions to be submitted in updated versions within one month.



Photo 4: Visitors from pastoral areas in Lhasa
(photograph © Hermann Kreutzmann July 30, 2004)

Finally I would like to thank the local organisers of this conference and especially our hosts here in Lhasa for their excellent arrangements and kind hospitality. Dr. Nyima Tashi and Dr. Yi Shaoliang acted as chairmen of the workshop and led us through the workshop in such a way that the results from the previous contributions led logically to the next steps. My sincere gratitude goes to Yang Yong who is named in representation of a whole team of diligent

and professional supporters. Wang Li kindly volunteered to report and document the results of the workshop. Thanks go to our interpreters and facilitators for enabling the required communication and discussions. The regional and national partners supported the setup and design of the format of this conference as well as the selection of participants. Thanks to the National Planning Commission of Nepal, AKRSP in Pakistan, MSDSP in Tajikistan and to ICI-MOD in Kathmandu. The steering and management in InWEnt's mountain programme headquarters in Feldafing was organised by Jürgen Richter, the Programme Manager, and Ms Stefanie Ledig made sure that we all met here in Lhasa.

Let me thank all of you for coming to Lhasa and wish you a happy and safe journey back home.

>>> 10 Annexes

10.1 Conference and Fieldwork Programme

Tuesday October 19th and Wednesday October 20th, 2010

Arrival and Registration of international participants

Thursday October 21st, 2010

Opening Ceremony

- 09:30 **Welcome Speech**
Dr. Yi Shao Wang, TAAAS
- Welcome Address**
Dr. Yi Shaoliang, ICIMOD
- Welcome Address**
Jürgen Richter, Senior Project Manager, InWEnt
- Welcome Speech**
Mr. Gopi Nath Mainali, Joint Secretary, National Planning
Commission, NPC, GON
- Welcome Speech**
Mr. Ding Ye Xian, Vice Governor TAR, China
- Introduction of Workshop Objectives and Structure**
Chairman, Dr. Nyima Tashi

10:20 **Coffee Break / Group Picture**

Key Note Addresses

- 11:00 **The Tibetan Plateau as an Eco-shelter**
Prof. Yang Yong Ping, Deputy Director, ITPCAS
- 11:30 **Pastoralism and rangeland management in relation to
eco-tourism and nature protection**
Dr. Yi Shaoliang and Ismail Muhammad, ICIMOD

12:00	Pastoral practices on the move – Recent transformations in mountain pastoralism on the Tibetan Plateau Prof. Dr. Hermann Kreutzmann, ZELF
12:30	Lunch Break
13:40	The eco-shelter concept and its impact for the Tibetan Plateau Dr. Zhang Yong Ze, Director, TEPB (Mr. Yan Guan Yu representing)
14:10	The eco-shelter concept and its impact for Xinjiang mountain regions Mr. Zhang Jian Li, Xinjiang Grassland General Station
14:40	Questions and Answers
15:00	Coffee Break
15:30	Panel Discussion
18:20	Departure for Dinner Reception

Friday 22nd, October 2010

09:30 Opening and Orientation on the day
Conference Chair

Case Studies

09:40 Sustainable Cross-border Ecotourism Strategy in the Tibetan Plateau Region
Dr. Dinesh Devkota, Hon. Member, National Planning Commission, GON

Eco-tourism and nature protection versus mountain pastoralism in Nepal
Narendra Lama, NTNC

10:40 Eco-tourism in the Nam Tso area
Prof. Guge Qimeiduoji, Tibet University (TU)

Pastoralism as a contributor to niche production
Dr. Madhav Karki, ICIMOD

11:40 Coffee Break

12:00	<p>Production and marketing of livestock products in the Hindu Kush-Karakorum-Himalaya Ghulam Amin Beg (AKRSP) and Dr. Inam-Ur Rahim (HUJRA)</p> <p>Yartsa gunbu (<i>Cordyceps sinensis</i>) as a valuable income resource for pastoral households Prof. Wangmu, Academy of Agriculture, Tibet University</p>
13:00	Lunch Break
14:00	<p>Recent Changes in pastoral systems in Tajikistan Yodgor Qonunov, Natural Conservation Department of GBAO</p> <p>Socio-economic changes in pastoral systems on the Tibetan Plateau Prof. Long Rui Jun, Lanzhou University</p>
15:00	Introduction to Group Work
15:10	Coffee Break
15:40	<p>Facilitated Group Discussions</p> <ul style="list-style-type: none"> • Reflection on inputs • Open questions • Challenges for Pastoralism and Rangeland Management
19:00	Dinner

Saturday, 23rd October 2010

Field Visit to Nam Tso Region

Sunday, 24th October 2010

09:30 Opening and Orientation on the day
 Conference Chair

Group Discussions

09:45 Introduction to Group Work

10:00 Facilitated Group Discussions

- Current situation of Pastoralism and Rangeland Management on the Tibetan Plateau
- Assessment of achievements
- Existing constraints and challenges for sustainable livelihood

13:00	Lunch Break
14:00	<ul style="list-style-type: none"> • Presentation of working group results • Discussion and addition • Identification of areas / topics for recommendations
15:00	Coffee Break
15:30	Facilitated Group Discussions <ul style="list-style-type: none"> • Vision and strategic options for future development
19:00	Dinner

Monday 25th, October 2010

09:30	Opening and Orientation on the day Conference Chair
Recommendations	
09:45	Introduction to Group Work
10:00	Facilitated Group Discussions <ul style="list-style-type: none"> • Formulation of recommendations
12:00	Presentation and Discussion of recommendations
13:00	Lunch Break
14:00	Editorial committee Side event: City Tour
Closing Ceremony	
17:00	Special Lecture: Achievements and future development of Agriculture in Tibet Mr. Ding Ye Jian
17:30	Presentation of final recommendations Additional guests
17:45	Conference Summary and Closing Remarks Prof. Dr. Hermann Kreutzmann, ZELF
afterwards	Dinner Reception

10.2 List of Participants

PR of China	
<p>Ms. Bailing Vice President College of Science, Tibet University</p> <p>Tibet University No. 36 Jiangsu Lu, Lhasa China 850001 Tel: 0086 891 6313816 Email: bailing@utibet.edu.cn</p>	<p>Ms. Cao Zhong Hua Researcher Department of Agriculture and Animal Husbandry</p> <p>Department of Agriculture and Animal Husbandry No. 36 Jiang Su Lu, Lhasa China 850000 Tel: 0086 891 6323678 Fax: 0086 891 6323678 Email: caohua73@yahoo.cn</p>
<p>Mr. Baimalunzhu Ritu County Government</p> <p>Ritu County Government Ritu County, Ali Prefecture Tibet Autonomous Region China 859700 Tel: 0086 897 2642601 Email: baima8686@163.com</p>	<p>Mr. Cirenzhaxi Veterinary Dang Xiong County Agriculture and Livestock Bureau</p> <p>Agriculture and Livestock Bureau No. 3, Dang Qu He Xi Lu, Dang Xiong County Tibet Autonomous Region China 851500 Tel: 0086 18908916599 Fax: 0086 891 6112115</p>
<p>Dr. Canmyou Researcher Livestock and Veterinary Research Institute, TAAAS</p> <p>Livestock and Veterinary Research Institute, TAAAS No. 56 Duo Di Lu, Lhasa China 850001 Tel: 0891 6384765 Fax: 0891 6384765 Email: tsamyu@yahoo.cn</p>	<p>Mr. Danba Associate Professor Academy of Agriculture, Tibet University</p> <p>Academy of Agriculture, Tibet University No. 8 Xue Yuan Lu, Ba Yi Town, Ling Zhi Prefecture Tibet Autonomous Region China 860000 Tel: 0086 894 5822668 Fax: 0086 894 5822650</p>

PR of China	
<p>Mr. Dawaluobu Vice Governor Nie Rong County Government</p> <p>Nie Rong County Government Nie Rong County, Naqu Prefecture Tibet Autonomous Region China 853500 Tel: 0086 18889006667 Fax: 0086 896 3652229</p>	<p>Prof. Guge Qimeiduoji College of Science, Tibet University</p> <p>Tibet University No. 36 Jianguo Lu, Lhasa China 850001 Phone: +86 13549069777 Email: 963118910@qq.com</p>
<p>Ms. Dawayangla Researcher Livestock and Veterinary Research Institute, TAAAS</p> <p>Livestock and Veterinary Research Institute, TAAAS No. 56 Duo Di Lu, Lhasa China 850001 Tel: 0086 891 6380923 Fax: 0086 891 6380923 Email dwyla@126.com</p>	<p>Mr. Ji Guang Nan Researcher Xinjiang Autonomous Region Federation of Social Sciences</p> <p>Xinjiang Autonomous Region Federation of Social Sciences Floor 8, Xinwen Building, Jinyin Avenue, Urumqi China 830001 Tel: 0086 991 8556061 Fax: 0086 991 8558925 Email: 18909926497@126.com</p>
<p>Mr. Duojiredeng Director Naqu Prefecture Agriculture and Livestock Bureau</p> <p>Naqu Prefecture Agriculture and Livestock Bureau No. 12, Zhe Jiang Zhong Lu, Naqu Town Tibet Autonomous Region China 852000 Tel: 0086 896 3824235 0086 13908963887 Fax: 0086 896 3822714</p>	<p>Dr. Long Rui Jun Professor Institute of Pastoral Agriculture Science, Lanzhou University</p> <p>Institute of Pastoral Agriculture Science Lanzhou University No. 768 Jia Yu Guan Xi Lu, Lanzhou China 730020 Tel: 0086 931 8915650 Fax: 0086 931 8915650 Email: longrj@lzu.edu.cn</p>
<p>Mr. Gongjueciren Vice Governor Ni Ma County Government</p> <p>Ni Ma County Government Ni Ma County, Naqu Prefecture Tibet Autonomous Region China 853200 Tel: 0086 13908963859</p>	<p>Dr. Nyima Tashi (Nimazhaxi) Vice President TAAAS</p> <p>Tibet Academy of Agricultural and Animal Husbandry Sciences (TAAAS) No. 130 Jin Zhu Xi Lu, Lhasa China 850000 Tel: +86 891 68 69 071 Fax: +86 891 6863313 Email: ntashi@taaas.org</p>

PR of China

<p>Ms. Qin Ai Qiong Researcher Livestock and Veterinary Research Institute, TAAAS</p> <p>Livestock and Veterinary Research Institute, TAAAS No. 56 Duo Di Lu, Lhasa China 850001 Tel: 0086 891 6384415 Email: qinaiqiong1975@163.com</p>	<p>Mr. Suolangciren Ban Ge County Government</p> <p>Ban Ge County Government Ban Ge County, Naqu Prefecture Tibet Autonomous Region China 852500 Tel: 0086 896 3672139</p>
<p>Mr. Qu Guang Peng Livestock and Veterinary Research Institute, TAAAS</p> <p>Livestock and Veterinary Research Institute, TAAAS No. 56 Duo Di Lu, Lhasa China 850001 Tel: 13549087668 Email: qgp0707@163.com</p>	<p>Mr. Wangdui Deputy Director Vegetable and Flower Research Institute, TAAAS</p> <p>Vegetable and Flower Research Institute, TAAAS No. 130 Jin Zhu Xi Lu, Lhasa China 850000 Tel: 0086 13989091116</p>
<p>Dr. Shang Zhan Huan Associate Professor Lanzhou University</p> <p>Lanzhou University No. 768 Jia Yu Guan Xi Lu, Lanzhou China 730020 Tel: 0086 931 8914107 Fax: 0086 931 8914107 Email: shangzh@lzu.edu.cn</p>	<p>Mr. Wang Fu Li Senior Livestock Technician Tibet Autonomous Region Poverty Alleviation Office</p> <p>Tibet Autonomous Region Poverty Alleviation Office No. 5, Se La Lu, Lhasa China 850000 Tel: 0086 891 6333470 Fax: 0086 891 6335877 Email: wflacer@163.com</p>
<p>Mr. Wang Jian Director General Tibet Autonomous Region Poverty Alleviation Office</p> <p>Tibet Autonomous Region Poverty Alleviation Office No. 5, Se La Lu, Lhasa China 850000 Email: ianw@sohu.com</p>	<p>Mr. Yang Wen Cai Livestock and Veterinary Research Institute, TAAAS</p> <p>Livestock and Veterinary Research Institute, TAAAS No. 56 Duo Di Lu, Lhasa China 850001 Tel: 0086 13549016291 Email: jhgs02@sohu.com</p>

PR of China	
<p>Mr. Wang Long Division for Climate Change Tibet Autonomous Region Development and Reform Commission</p> <p>Tibet Autonomous Region Development and Reform Commission No. 22 Beijing ZhongLu, Lhasa China 850000 Tel: 0086 891 6321294 Fax: 0086 891 6321294 Email: wlont@163.com</p>	<p>Mr. Yang Yong Deputy Director Division of International Cooperation, TAAAS</p> <p>Tibet Academy of Agricultural and Animal Husbandry Sciences (TAAAS) No. 130 Jin Zhu Xi Lu, Lhasa China 850000 Tel: +86 891 68 63 313 Fax: +86 891 6863313 Email: Yang.Yong@taaas.org</p>
<p>Prof. Wangmu Academy of Agriculture, Tibet University</p> <p>Academy of Agriculture, Tibet University No. 8 Xue Yuan Lu, Ba Yi Town, Ling Zhi Prefecture Tibet Autonomous Region China 860000 Tel: 0086 894 5822668 Fax: 0086 894 5822650 Email: wangmutb@yahoo.com.cn</p>	<p>Prof. Yang Yong Ping Deputy Director Institute of Tibetan Plateau Research Chinese Academy of Sciences</p> <p>Institute of Tibetan Plateau Research Chinese Academy of Sciences PO Box 2871 No. 18 Shuang Qing Lu, Hai Dian District China 100085 Tel: 0086 10 62849361 Fax: 0086 10 62849886 Email: yangyp@mail.kib.ac.cn</p>
<p>Mr. Wang Xiao Wei Assistant Researcher Agricultural Economics and Technology Information Institut , XAAS</p> <p>Agricultural Economics and Technology Information Institute, Xinjiang Academy of Agriculture Sciences (XAAS) No. 403 Nan Chang Lu, Urumqi China 830091 Tel: 0086 991 4514024 Fax: 0086 991 4516905 Email: wangxw.com@126.com</p>	<p>Mr. Yiziduoji Researcher Livestock and Veterinary Research Institute, TAAAS</p> <p>Livestock and Veterinary Research Institute, TAAAS No. 56 Duo Di Lu, Lhasa China 850001 Tel: 0086 891 63899339 Fax: 0086 891 6389339 Email rongshanyang@sina.com.cn</p>

PR of China

<p>Mr. Yundan Deputy Director Agriculture and Livestock Bureau</p> <p>Agriculture and Livestock Bureau Lin Zhou County, Lhasa China 851600 Tel: 0086 13628986006</p>	<p>Mr. Zhao Hao Xin Director Livestock and Veterinary Research Institute, TAAAS</p> <p>Livestock and Veterinary Research Institute, TAAAS No. 56 Duo Di Lu, Lhasa China 850001 Tel: 0086 13908984121 Fax: 0086 891 6384268 Email: zhaohaoxin01@163.com</p>
<p>Mr. Zhang Hai Qing Vice Governor Dang Xiong County Government</p> <p>Dang Xiong County Government Dang Xiong County, Lhasa Tibet Autonomous Region China 851500 Tel: 0086 13908902610 Fax: 0086 891 6112125</p>	<p>Mr. Zhao Shun Fa Vice Governor Shen Zha County Government</p> <p>Shen Zha County Government Shen Zha Town, Naqu Prefecture Tibet Autonomous Region China 853100 Tel: 0086 13908918598 Email: xz_zsf@yahoo.com.cn</p>
<p>Mr. Zhang Jian Li Senior Livestock Technician Xinjiang Grassland Station</p> <p>Xinjiang Grassland General Station No. 58 Yan Er Wo Lu, Urumqi China 830049 Tel: 0086 991 8531158 Fax: 0086 991 8531158 Email: xj_zjl@sohu.com</p>	<p>Mr. Zheng Yu Bao Senior Livestock Technician Lhasa Agriculture and Livestock Bureau</p> <p>Lhasa Agriculture and Livestock Bureau No. 36, Duo Sen Ge Lu, Lhasa China 850000 Email: 13910380030@139.com</p>

PR of China	
<p>Dr. Zhang Yong Ze Director Department of Environment Protection</p> <p>Tibet Autonomous Region Department of Environment Protection No. 26 Jingzhu Zhong Lu, Lhasa China 850000</p>	<p>Mr. Zhou Wen Yong Agriculture and Livestock Bureau No. 3, Dang Qu He Xi Lu, Dang Xiong County Tibet Autonomous Region China 851500 Tel: 0086 13889083178 Fax: 0086 891 6112115 Email: zhouwenyong002@163.com</p>
Nepal	
<p>Dr. Karki, Kedar Bahadur Senior Veterinary Officer</p> <p>DoLS – Department of Livestock Services Department of Livestock Services Central Veterinary Laboratory Kathmandu Nepal Phone: +977 14212143 (0) +977 9841258735 (Cell) Fax: +977 14261867 Email: dr.kedark@yahoo.com drkedarkarki@gmail.com</p>	<p>Mr. Narendra, Lama Research Officer</p> <p>NTNC – National Trust for Nature Conservation ACAP, UCO Lomanthang, Upper Mustang Kathmandu Nepal Phone: +977 1 5526553 Fax: +977 1 5526571 Email: nlama_7@yahoo.com narendralama@gmail.com</p>
<p>Mr. Khadka, Manahari Under Secretary NPC</p> <p>NPC – National Planning Commission National Planning Commission Central Secretariat Government of Nepal PO Box 1284 Singha Durbar Kathmandu Nepal Phone: +977 1 4226818 Email: khadkamh@yahoo.com, mhkhadka@npcnepal.gov.np</p>	<p>Dr. Pandey, Shankar Livestock Development Officer</p> <p>Department of Livestock Services National Pasture and Animal Feed Centre Hariharbhawan Lalitpur Nepal Phone: +977 15010056 (0) Fax: +977 15010063 Email: drspvet@gmail.com</p>

Nepal

Mr. Mainali, Gopi Nath

Joint Secretary, National Planning
Commission

NPC, Central Secretariat
Government of Nepal
PO Box 1284
Singha Durbar
Kathmandu
Nepal

Phone: +977 1 4226818

Email: gnmainali@npcnepal.gov.np
mainaligopi@gmail.com

Mr. Thakur, Uday Chandra

Chief Livestock Development Officer

Department of Livestock Services
Directorate of Livestock Production
Harihar Bhawan
Lalitpur
Nepal

Phone: +977 15548356 (0)

Fax: +977 15542016

Email: uday_pipra@yahoo.com

Mr. Yadav, Devendra Prasad

Chief Livestock Development Officer

Department of Livestock Services
National Pasture and Animal Feed
Centre
Harihar Bhawan
Lalitpur
Nepal

Phone: +977 15010056 (0)

Fax: +977 15010063

Email: ydevendra77@yahoo.com

Pakistan

Mr. Hunzai, Izhar Ali

General Manager

Aga Khan Rural Support Programme (AKRSP)
Baber Road
Gilgit
Pakistan

Phone : +92 51 2275746

E-Mail: izhar.hunzai@akrsp.org.pk

Tajikistan

Mr. Qonunov, Yodgor

Inspection Unit Manager

Natural Conservation Department of GBAO

Lenin St. 26

Khorog, GBAO

Tajikistan

Mob: +92 93 5000 111

Phone : +92 35 222 222 1

Email: yodgorqonunov@yahoo.com

yodgor73@mail.ru

International Participants

Dr. Inam-ur-Rahim

HUJRA, NGO Pakistan, and: Research Associate University of Central Asia

HUJRA

House Number 209

Street 67, Sector G-8/1

Islamabad

Pakistan

University of Central Asia

207 Panfilova Street

720040 Bishkek

Kyrgyz Republic

Mobile (Pakistan): +923012691382

Phone (Kyrgyzstan): +996 312 692873

Email: irahim33@yahoo.com

Mr. Roehrl, Roman

Junior Expert

GTZ Nepal

Environment and Climate Change

Deutsche Gesellschaft

für Technische Zusammenarbeit (GTZ)

GmbH

P.O. Box 1457

Neer Bhawan, Sanepa

Kathmandu/Nepal

Phone : +977 1 5523228

Fax : +977 1 5521982

Mobile Germany:

+49176 26 24 94 10

Email: roman.roehrl@gtz.de

Mr. Ismail, Muhammad

ICIMOD

ICIMOD – International Centre for Integrated

Mountain Development

GPO Box 3226

Khumaltar, Lalitpur, Kathmandu

Nepal

Phone: +977 1 5003222 EXT 318

Fax: +977 1 5003299

Email: mismail@icimod.org

Mr. Richter, Jürgen

Senior Project Manager

InWEnt Dept. 5

Environment, Natural Resources and Food

Wielinger Straße 52

82340 Feldafing

Phone : +49 8157 938 103

Fax +49 8157 938 777

Email: juergen.richter@inwent.org

International Participants

Dr. Karki, Madhav Bahadur

Deputy Director General

ICIMOD – International Centre for
Integrated

Mountain Development

GPO Box 3226

Khumaltar, Lalitpur

Kathmandu

Nepal

Phone: +977 1 5003222 Ext 208,

Direct Line 5003318,

Fax +977 1 5003277

Email:

mkarki@icimod.org karkimadhav@gmail.
com

Prof. Dr. Kreutzmann, Hermann

Director, Institute of Geographic
Sciences

ZELF – Centre for Development Studies

Freie Universitaet Berlin

Malteserstr. 74-100

Building K

D-12249 Berlin

Germany

Phone : +49 30 838 70224

Fax: +49 30 838 70 757

Email: h.kreutzmann@fu-berlin.de

Dr. Yi, Shaoliang

Team Leader Rangeland Resources
Management,

Environmental Change and Ecosystem
Service

Rangeland Management Action Areas

ICIMOD – International Centre for
Integrated

Mountain Development

GPO Box: 3226

Kumaltar, Lalitpur

Kathmandu

Nepal

Phone: +977 1 2210889

Fax: +977 1 5003299

Email: syi@icimod.org

Staff	
<p>Mr. Balzer, Geert Facilitator</p> <p>TEAM CONSULT Malerwinkel 6 22607 Hamburg Phone: +49 40 898 251 Fax +49 40 898 253 Email: teamconsult@gmx.de balzer@teamconsult.org</p>	<p>Ms. Huang, Wei Hong (Alice) Interpreter Chinese Managing Director</p> <p>Enter Consulting (Shanghai) Co. Ltd. Rm.1017 No.2025 West Zhongshan Road 200235 PR China Phone: +86 21 64814581 Fax: +86 21 64814583 Mobile: +86 13701865644 Email: alicenter@vip.163.com</p>
<p>Mr. Ding, Jie (Frank) Co-Moderator, Facilitator</p> <p>Sino-German Microfinance Capacity Building Initiative Beijing Sino-German Microfinance Consulting Co., Ltd. Room 501 Di Yang Office Building No.H2 Dongsanhuanbeilu Chaoyang District Beijing, PRC 100027 Phone: +86 10 84537163/6169-818 Fax: +86 10 84537163/6169-805 Mobile: +86 13801310385 Email: jie.ding@bjrongxin.cn</p>	<p>Ms. Ledig, Stefanie Project Manager</p> <p>InWEnt Dept. 5 Environment, Natural Resources and Food Wielinger Straße 52 82340 Feldafing Germany Phone : +49 81 57938 312 Fax +49 81 57938 777 Email: stefanie.ledig@inwent.org</p>
<p>Ms. Zhao, Ruo Yu (Eve) Interpreter Chinese</p> <p>Enter Consulting (Shanghai) Co. Ltd. Room 1017 No.200235 Zhong Shan Xi Lu Shanghai PR China Phone: +86 21 64814581 Fax: +86 21 64814583 Mobile: +86 13918602858 Email: eveenter@vip.163.com</p>	

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Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
Friedrich-Ebert-Allee 40
53113 Bonn
T +49 228 4460-0
F +49 228 4460-1766
E info@giz.de
I www.giz.de

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
Rural Development and Food
Stefanie Ledig
Wielinger Str. 52
82340 Feldafing, Germany
T +49 8157 938-312
F +49 8157 939-777
E stefanie.ledig@giz.de

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Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Wielinger Str. 52
82340 Feldafing, Germany
T +49 8157 938-0
F +49 8157 939-777
E info@giz.de
I www.giz.de