

Rangelands - Ecology, Management and Development

General

001 World Resources Institute / International Institute for Environment and Development. **Forests and rangelands.** In World Resources Institute/International Institute for Environment and Development. World resources 1988-89: an assessment of the resource base that supports the global economy with data tables for 140 countries. Washington, DC: World Resources Institute/London: International Institute for Environment and Development. 69-88p.

Keyword(s): Forest resources / Rangelands

Call No: R333.7 WOW

Lang: En

Forest and rangelands, which together cover about 84 per cent of the Earth's land surface, supply the basic products of wood, meat, and milk. Managing them sustainably is one of our greatest challenges. A prerequisite to sound management is thorough knowledge of the resource base. The study of resource management in developing countries is one with good intentions, but unsatisfactory results. This paper discusses forest resources of the world and rangelands of selected Asian countries. It also highlights the causes, rates, and trends of tropical deforestation and future trends in industrial wood production and trade. The rangeland conditions of China and Mongolia are discussed, especially the new and old approaches to rangeland management of Sub-Saharan Africa. Finally, recent developments in tropical forestry action plan and radioactive rangelands are discussed.

002 Bews, J. W. 1984. **The world's grasses: their differentiation, distribution, economics and ecology.** New Delhi: Periodical Expert Book Agency. 408p.

Keyword(s): Plant ecology / Species / Grasses

Call No: 581.652 BEW

Lang: En

This book covers a very wide range of information regarding the grasses of the world. The work is mainly based on plant differentiation of the tribes and the genera. Emphasis has been laid throughout on facts of economic importance and on the ecology of grasslands. Morphology, taxonomy, phylogeny, distribution, economics, ecology, and physiology of the grasses are also given. In the first half of this book, the grasses and their behaviour is more or less confined to those of Great Britain and South Africa, but in the latter section most of the important genera of the world are reported with their distribution, ecology and economics.

003 Child, R. D.; Hady, H. F.; Peterson, R. A. 1987. **Arid and semiarid rangelands: guidelines for development.** Morrilton, AR: Winrock International Institute for Agricultural Development. 291p.

Keyword(s): Pasture management / Rangelands / Vegetation

Call No: 574.52643 CHA

Lang: En

This paper brings together some information on the structure and function of arid and semi-arid ecosystems, and the experience of past developmental efforts in developing countries. Although the coverage is worldwide, the emphasis is on Africa. This publication has been divided into four parts. A preview of these four parts is as follows: (a) ecosystem, (b) guidelines for natural resource development (c) guidelines for development of national/regional services and, (d) guidelines for programme planning and documentation. The first section describes the basic arid/semi-arid ecosystem and the importance of understanding the interrelations of the components of the system. The remaining three sections contain specific guidelines, in the form of stand-alone modules, in three of the more common areas of development activity. These common areas are: i) the natural resource base itself, ii) national and regional institutions that interact with the resource base through the human inhabitants of the ecosystem, and iii) the planning-assessment-monitoring process. Emphasis is given to the following six major components of a rangeland ecosystem: soils, microclimate, decomposers and microconsumers, vegetation, animal population, and people.

004 Curry-Lindahl, K. 1978. **Conservation problems of savannahs and other grasslands.** In Schofield, E. A. (ed.) Earthcare: global protection of natural areas - proceedings of the Fourteenth Biennial Wilderness Conference held on Apr 1978 at New York. 359-385p.

Keyword(s): Ecosystems / Grasslands / Nature conservation

Call No: 333.7 SCE

Lang: En

Today, most grassland habitats of the world are on marginal land. But such land has a value, provided, it is wisely used and managed instead of gradually destroyed. The great value of marginal lands is their productivity in the form of animals. This paper focusses on the conservation problems of savannahs and other grasslands. As the conservatism of agriculturalists, who are unwilling to recognise that animals, other than the few species hitherto domesticated, are a potential resource, is distressing. In this context, this paper defines the grasslands and presents the distribution patterns of grasslands,

discusses the deterioration and desertification of the world's grassland, and productivity of marginal grasslands. The problems of nomadic and semi-nomadic pastoralism in tropical grasslands is also discussed. Finally, management and utilisation of grassland ecosystem by implementing an action programme for grasslands is explained.

005 Muhammad Asghar. 1994. **Range management and forage production programmes in developing state.** *Progressive farming* 14(1):34-36

Keyword(s): *Rangelands / Developing countries / Food crops / Feed crops*

Call No: 631.05 PRF

Lang: En

'Range management' means essentially, the adoption of specific techniques for maximising the productivity of grazing lands. Grazing capacity has been decreased to a drastic extent below present potential of rangelands due to high pressure of unsystematic livestock grazing in developing countries. Therefore, range management and improvement practices are extremely important for developing countries. Major measures regarding range management and forage programmes in developing states is discussed in this paper with proper illustrations and recommendations.

006 Myers, N. 1978. **Wildlife of savannahs and grasslands: a common heritage of the global community.** In Schofield, E. A. (ed.) *Earthcare: global protection of natural areas - proceedings of the Fourteenth Biennial Wilderness Conference held on Apr 1978 at New York.* 385-409p.

Keyword(s): *National parks / Wildlife / Grasslands*

Call No: 333.7 SCE

Lang: En

Tropical savannahs, especially grasslands, are likely to be fundamentally modified. Some savannahs sustain the most spectacular array of large mammals left on earth. African grasslands, in particular, support exceptional throngs of wildlife. First part of this paper focusses on the savannah zones of the world with particular emphasis on the savannahs of Africa. Many of Africa's grasslands are being changed, with progressive impact. Three major activities modifying the grasslands in Africa are: livestock husbandry, anti-tsetse measures, and the spread of cultivation. The second part of this paper focusses on the 'common heritage' aspects of wildlife conservation. It attempts a preliminary exploration of the topic and seeks to ask some right questions, rather than to provide conclusive answers.

007 Olang, M. O. 1985. **Range monitoring methodologies.** In Kategile, J. A. (ed.) *Pasture Improvement Research in Eastern and Southern Africa: proceedings of the workshop held on 17-21 Sep 1984 at Harare.* Ottawa, Ont: International Development Research Centre. 452-464p.

Keyword(s): *Rangelands / Pastures*

Call No: 636.08551 KAP

Lang: En

There are various methods used in vegetation mapping, surveying, and monitoring. The methods include: aerial photography, satellite imagery interpretation, area frame sampling, step point, and the fixed transect method. Vegetation mapping and monitoring with the aid of aerial photographs is very expensive and slow. But the use of landset imagery in vegetation mapping is fast and relatively cheap. All these methods used for range monitoring have been discussed in this paper.

008 Ponce, S. L. (ed.) 1983 **The potential for water yield augmentation through forest and range management.** Bethesda, MD: American Water Resources Institute. [68]p.

Keyword(s): *Forest management / Rangelands / Water resources / Water management*

Call No: 551.48 POP

Lang: En

The potential for augmenting water yield by manipulating vegetation within a basin has intrigued hydrologists for decades. This edited volume includes papers which discuss the potential for water yield augmentation through forest and range management. The first five papers of this volume summarises the current knowledge about augmenting water yields by forest and range management practices in the U.S., Rocky Mountain and Intermountain west, Sierra Nevada, and western Oregon, and western Washington. Through the presentation of research results, the opportunities and limitations for augmenting water yields are discussed. Each author emphasises that although the greatest potential is on undisturbed watersheds, opportunities are restricted on a large-scale because of past management practice and land ownership. The sixth paper presents a provisional economic assessment of joint production of water and timber. The last paper summarises major issues associated with water yield augmentation by forest and range management practices. These include: (i) the problem of predicting increased yields from large basins, (ii) economic evaluation of additional flows, (iii) legal acceptance of and the need for system models, (iv) the legal question of ownership and transferability of increased yields, and (v) management emphasis on private and federal lands.

009 *Rothermel, R. C.* 1983. **How to predict the spread and intensity of forest and range fires.** Ogden, UT: U. S. Dep. of Agriculture. Intermountain Forest and Range Experiment Station. 161p.

Keyword(s): *Forest fires / Fire control*

Call No: 634.9618 ROH

Lang: En

This manual documents the procedures for estimating the rate of forward spread, intensity, flame length and size of fires burning in forests and rangelands. It contains instructions for obtaining fuel and weather data, calculating fire behaviour and interpreting the results for application to actual fire problems. Potential uses include fire prediction, fire planning, dispatching, prescribed fires, and monitoring managed fires. Additionally, this documents includes sections that deal with fuel model selection, fuel moisture, wind slope, calculations with monographs, TI-59 calculations, point source, line fire, interpretations of outputs and growth predictions.

Hindu Kush-Himalayan Region

010 *Shah, B. H.; Rafique, S. M.* 1989. **Regional seminar on problems affecting range and pastureland development in Himalayan region held on 19-26 November 1989 in Peshawar, Pakistan.** Peshawar: Pakistan Forest Inst. 221p.

Keyword(s): *Pasture management / Himalayas / Land development / Rangelands*

Call No: 333.74 SHR

Lang: En

The proceedings include 20 papers dealing with the problems, status of management and conservation of rangeland, and range and pasture improvement techniques. The volume also includes a section on conclusions and recommendations made during the seminar. In each country paper, emphasis is given to certain crucial aspects of range and pasture land problems and other practices in relation to livestock productivity in the area, followed by a required action plan on national, regional, and international level.

Bhutan

011 *Dunbar, G. A.* 1979. **Alpine pastures, ecology and improvement.** Rome: FAO. 10p.

Keyword(s): *Hills / Alpine ecosystem / Pastures / Ecology / Bhutan*

Call No: 636.08551 DUA P

Lang: En

Vegetative conditions in pastoral areas in the

northwestern Bhutan are reported to be from fair to poor, reflecting very heavy use. Grasses constitute a relatively low proportion of the vegetable cover, over large areas. The provision of pasture or fodder for winter is reported to be a problem in all areas seen in Bhutan, although the cause of the problem varies in different parts of the country. This document thus, presents a concise report on alpine pastures and their ecology. Various features and programmes required for the conservation and improvement of pastures, based upon the visit made for the National Sheep and Yak Development Project.

China and the Tibetan Plateau

012 *Jin Zhenzhou.* 1986. **The characteristics and utilization of shrub-grasslands in tropical and subtropical mountains of Yunnan.** *Acta phytocologica et geobotanica Sinica* 10(2):81-89

Keyword(s): *Grasslands / Land use / Hills / Ornamental shrubs / Vegetation / China, Yunnan*

Call No: 574.5 ACP

Lang: Ch

013 *Li Jinming.* (ed.) 1988 **An atlas of rangeland and its main plant resources on the Qinghai, Tibet plateau.** Beijing: Agricultural Publishing House. 166p.

Keyword(s): *Rangelands / Plant resources / China, Tibet*

Call No: R 633.2 JIA

Lang: En

Qinghai is a part of the main body of the Qinghai-Tibet Plateau, which is contiguous to the Sichuan basin, the Hexi corridor, and the southern part of Xinjiang. It has a critical agro-ecological importance in the development of pasture-agronomy farming system. This atlas of rangeland is divided into three major parts. The first part covers the ecological environment of rangeland, which has been briefly described. The classes of rangeland is covered in the second part, each being described with a photograph. The main plant resources of rangeland is covered in the third part. Regarding these three topics, over 400 maps are illustrated in the Atlas. It also includes a collection of photographs of plant resources and different classes of rangeland describing the beauty of the Qinghai-Tibet Plateau. An index of Chinese and Latin names of plants are part of the Annex.

014 *Li Shoude; Yang Ailian.* 1993. **Strengthening nature preservation work in**

grassland for the improvement of ecological environment and the development of economy. In Chinese Academy of Sciences. Inst. of Botany. National parks and protected areas of east Asia: proceedings of the First Conference on National Parks and Protected Areas of East Asia and the Fourty one working session of IUCN CNPPA held on 12-18 Sep 1993 at Beijing, China. Beijing: Chinese Academy of Sciences. Inst. of Botany. 166-172p.

Keyword(s): *Economic development / Nature reserves / Nature conservation / Grassland management*

Call No: 639.95 BON

Lang: En

Grassland of China covers a very large area which grows a thousand varieties of plants and have a thousand species of animals, among them are medicinal plants, top-quality pasture grasses, rare plants and animals and many precious livestock species. However, the natural resources in grasslands are being threatened by increasing pressure of human activities. The large area of grasslands is gradually depleting, and its biota is on the verge of destruction. Therefore, some of the valuable genetic resources have vanished from the grasslands. The situation tends to be worsening. This paper describes different measures taken for the strengthening of nature preservation work in grasslands of China for the improvement of ecological environment and the development of economy.

015 Liu Yuman. 1993. **Rangeland degradation in the pastoral region of China: causes and countermeasures.** In Longworth, J. W. (ed.) Economic aspects of raw wool production and marketing in China. (ACIAR technical reports, 25). Canberra, ACT: Australian Centre for International Agricultural Research. 20-26p.

Keyword(s): *Rangelands / Environmental degradation / Pasture ecology / China*

Call No: 636.08845 LOE

Lang: En

The main causes and countermeasures for the rangeland degradation in the pastoral region of China are discussed in this paper. To highlight the causes for the degradation of rangeland, this paper presents a quantitative analysis of the imbalance between animal population and pasture development. To redress this imbalance, recommendations are suggested to take into account the problems of overpopulation, overstocking, and environmental degradation through different measures.

016 Miller, D. J. 1994. **Chang Tang wildlife reserve Tibet: rangeland survey report.** New York: New York Zoological Society. 52p.

Keyword(s): *Vegetation / Livestock / Rangelands / Protected areas / China, Tibet*

Call No: 639.95 MIC

Lang: En

The Changtang Wildlife Reserve in northern Tibet, established in 1992, is the largest protected area in Tibet and one of the largest protected areas in the world. This report summarises the findings from rangeland and livestock investigations and provides recommendations for further conservation work in the reserve. The findings are based on range ecology, livestock production practices, pastoral management strategies, and wildlife-livestock interaction in the reserve.

017 Ni Zubin. 1985. **Grassland resources and grazing systems in Xizang (Tibet).** Natural resources (3):13-19

Keyword(s): *Grazing lands / Animal husbandry / Grasslands / China, Tibet*

Call No: 333.7 NAR

Lang: Ch

018 Qiu Faying; Chen Qingheng. 1986. **Exploitation of the marshlands and the marshmeadows and rational use of the grassland resources in Ruergai region.** In Li Wenhua; Pandey, K. K. (eds.) Watershed management: proceedings of the International Workshop on Watershed Management in the Hindu Kush-Himalayan Region held on 14-19 Oct 1985 at Chengdu. Kathmandu: International Centre for Integrated Mountain Development / Beijing: Chinese Academy of Sciences. Commission for Integrated Survey of Natural Resources. 45-50p.

Keyword(s): *Grassland management / Vegetation / China*

Call No: 333.716 LIW

Lang: En

The grassland in Ruergai region is distributed over a large area of plentiful water and luxuriant grass, and is an important base for the plateau animal husbandry. The marshlands and marsh meadows have also been developed well and play an important role in the region. This paper based on the vegetation surveys of Ruergai region, presents suggestions for the exploitation of the marshlands and marsh meadows, and the utilisation of the pasture resources of the region. Characteristics of the natural environment of Ruergai region are also illustrated in brief.

019 Sheehy, D. P. 1992. **A perspective on desertification of grazingland ecosystems in north China.** *Ambio: a journal of the human environment* 21(4):303-307

Keyword(s): *Grassland ecology / Desertification / China*

Call No: 304.2 AMB **Lang:** En

Desertification of arid and semi-arid grazing land ecosystems is a serious problem in northern China. The contemporary desertification arises from the improper land use and production practices that are associated with economic, social and political agendas having precedence over ecological stability. Although degradation of grazing land leading to desertification is obvious and acknowledged, development emphasis continues to focus on sedentary agriculture. This paper examines the condition predisposing grazing land to desertification and describes the causes of desertification in the historical and contemporary context and suggests possible means to foster sustainable use of grazing land ecosystems.

020 Su Daxue. 1987. **Characteristics of natural grasslands in Guizhou Province and its evaluation.** *Journal of natural resources* 2(2):160-160

Keyword(s): *Grasslands / Resources evaluation / China*

Call No: 333.705 JON **Lang:** En/Ch

Studying natural grasslands of 84 counties in Guizhou Province and analysing 1,331 quadrat samples, this paper explains that these are the grasslands with secondary characteristics, most of them are unstable, situated in the succession from grasses to bush to forest, besides, there are also relatively stable alpine meadows and bush-grasslands with plagioclimax. The grasslands in Guizhou Province are mainly scattered patchily among the woodlands and agricultural fields. Large area of these grasslands are located on the middle-mountain areas and plateaus with the elevation above 1,000m, these places are characterised with small population, long distance from settlements, and difficulty of accessibility. The grasslands often stretch continuously as a belt on the ridges and tops of the middle-mountains. The total coverage of the grasslands in Guizhou, is about 80-85 per cent. The thickness of the grass layer is about 60-70cm, and the yield of the fresh grasses is about 6,000-9,000kg/ha. The time taken for the growth of green grass is about 240-300 days annually. There are 96 per cent of grasslands that can be used for making hays. The grasslands in Guizhou abound with variant plants, mainly winter-green or evergreen grasses. The alpine meadows have relatively high value for animal

husbandry. Most of them are suitable to exploitation with advantageous conditions. The quality of the grasslands in Guizhou is poor, 76.5 per cent of them are deficient in legumes, which occupy only 0.96 per cent of the total grasses by weight, they are the grasses with low content of protein. There are about 40 per cent of these grasslands with thin soil depth less than 40cm, and there are about 50 per cent of the grasslands with slopes more than 25 per cent, about 74.8 per cent with bare rocks or stones and 25 per cent undergo soil erosion. The durability for grazing is poor. All of these, to some extent, are the limitations to their exploitation.

021 Sue Daxue. 1990. **Methods of raising the production level of grasslands in the high-frigid pastoral areas.** (MFS [Mountain Farming Systems] discussion paper, 11). Kathmandu: International Centre for Integrated Mountain Development. 16p.

Keyword(s): *Mountain development / Pasture management / China*

Call No: 333.74 SUM P **Lang:** En

The paper analyses the characteristics and problems of grassland agriculture and low fodder productivity and low output of livestock products from high-frigid pastoral areas in Damxung County. The paper also provides recommendations and methods for improving productivity in these pastoral areas through technical and management changes.

022 Sun Qingguo. 1992. **Management of pastoral systems in the mountains: experiences and lessons from west Sichuan, China.** (MFS [Mountain Farming Systems] discussion paper, 30). Kathmandu: International Centre for Integrated Mountain Development. 29p.

Keyword(s): *Pasture management / Animal husbandry / China*

Call No: 634.99 SUM P **Lang:** En

This paper documents experiences in West Sichuan (China). The key features of the Chinese approach, which could be profitably adopted by other high mountain pastoral areas, are: focus on diverse local animals and local grazing plant species. Unlike conventional development interventions that focus on new introductions, China, through public interventions, attempts to better manage and improve environmentally well-adapted local (animal and grazing) resources by ameliorating deficits through evolving local resource-based options. This has helped maintain the biodiversity and has enhanced the economic gains of local communities. Besides providing a glimpse of the diverse animals and

grazing resources that exist in West Sichuan, the paper establishes a need for replication of the Chinese approach elsewhere in the HKH Region. The paper also documents a way in which high mountain 'niche' can be identified and harnessed on a sustained basis without undue disruptions associated with external interventions.

023 Sun Qingguo. 1989. **The pasture types and utilisation in Jinchuan county, Sichuan, China.** Kathmandu: International Centre for Integrated Mountain Development. 21p.

Keyword(s): *Pasture management / China, W Sichuan*

Call No: 633.202 SUP P **Lang:** En

Jinchuan County is situated in northern Hengduan mountains in northwestern Sichuan Province. Animal husbandry is one of the important farming components in the county. The pasture land is the basis of the pastoralism and the main source of fodder in Jinchuan. The quality and quantity of pastures directly influence the livestock products and the life of farmers. This paper evaluates the carrying capacity potentials of this pasture land by analysing pasture types, productivity, distribution, and utilisation of the pasture land. At the same time, some issues of management and utilisation are listed according to the investigation and some strategies for solving the problems are suggested.

024 Tian Xiaowen; Sun Qingguo. 1985. **Position of some knotwood plants in the fodder of natural grassland in Hengduan mountain area.** *Natural resources* (1):47-53

Keyword(s): *Grazing lands / Hills / Feed crops / Animal husbandry / xmChina*

Call No: 333.7 NAR **Lang:** Ch

025 Wang Yusheng; Pan Jiezheng. 1986. **Mathematical model for multifactorial evaluation of natural grassland resources.** *Acta phytocologica et geobotanica Sinica* 9(3):165-172

Keyword(s): *Natural resources / Mathematical models / Grazing lands / Grasslands / China*

Call No: 574.5 ACP **Lang:** Ch

026 Yang Dingguo. [1992]. **Degradation and protection of grassland on the Qinghai-Tibet plateau.** In Walling, D. E.; Davies, T. R. ; Hasholt, B. (eds.) *Erosion, debris flows and environment in mountain regions: proceedings*

of the International Symposium held on 5-9 Jul 1992 at Chengdu, China. (IAHS [International Association of Hydrological Sciences] publication, 209). Oxfordshire: International Association of Hydrological Sciences. 471-476p.

Keyword(s): *Soil deterioration / Soil erosion / Grassland management / China, Tibet*

Call No: 551.353 WAE **Lang:** En

The Qinghai-Tibet plateau, which has been called the roof of the world and the third pole, is a vast territory which includes a large area of grassland. Grassland degradation is an important component of eco-environmental degradation in the world today, and grassland protection represents an important aspect of eco-environment protection. This paper presents the characteristics of degraded grassland, and discusses the causes and trends of grassland degradation in the region. The countermeasures which have been proposed for protecting the grassland resource and preventing grassland degradation in the Qinghai-Tibet plateau have been reviewed.

027 Zhang Da-yong; Wang Gang; Du Guo-zhen. 1988. **A quantitative study of the vegetation succession on the abandoned arable lands of the subalpine meadows in gannan prefecture of Gansu Province [China]: analysis of community composition.** *Acta phytocologica et geobotanica sinica* 12(4):283-291

Keyword(s): *Land resources / Alpine ecosystem / Vegetation / Grasslands / China*

Call No: 574.5 ACP **Lang:** Ch

The study of the succession of plant communities in the abandoned arable lands in the area of subalpine meadows of Gannan prefecture, is made by inferring from comparing the representative sites of abandoned arable lands of different ages, which have been described in this paper. The analysis of community composition in succession shows: first, the importance of the grasses and sedge plants in the early stages of succession, they rapidly dropped from 71 to 6 per cent in 12 years, and as a result of the aggregation and spreading of grasses and sedge plants, they recovered gradually to 30-40 per cent in the early stages of succession and reduced in the later stages of succession, but the importance of poisonous herbs remains steady, accounting for about 10 per cent of the community; second, the species richness, Simpson's diversity and evenness of the community increases while its dominance decreases with the development of succession; third, the dominance diversity curve of the initial community

is roughly geometric, as species are added, the curve approaches to a lognormal distribution, but in the final stage, the curve approaches a MacArthur broken-stick distribution.

028 Zhou Shourong; Gan Youmin; Pu Chaolong. 1989. **Seasonal dynamics of phyto-biomass in subtropical mountainous grassland in Western Sichuan basin.** *Journal of ecology* 8(4):1-1

Keyword(s): Biomass / Grasslands / China, W Sichuan

Call No: 574.505 JOE

Lang: En/Ch

India

029 Bhat, S. A.; Kaul, V. 1989. **Grassland communities of Dachigam: Telbal catchment, Kashmir.** *The Indian forester* 115(8):567-577

Keyword(s): Grasslands / Environmental degradation / Jammu and Kashmir

Call No: 634.9 INF

Lang: En

The paper analyses the ecological status of three grasslands in Dachigam - Telbal Catchment, Kashmir. Study has revealed the presence of *Themeda anathera-chrysopogon echinulatus* association on the slopes subject to light grazing, *Poa stewartiana* - *Stipa sibirica* on the slopes subject to moderate grazing and *Cynodon dactylon* - *Bothriochloa pertusa* association on the slopes subject to heavy grazing. The result further indicates that grazing reduces the vegetal cover significantly. Mild grazing is observed to increase the plant species diversity, richness and evenness at the first instance and with heavy grazing these parameters are observed to be reduced significantly. More of protection has been observed to bring slight decrease in the values of these parameters. Similarity between the grasslands have been reported to be effected both qualitatively and quantitatively with varying degrees of protection and grazing. Possible causes of occurrence of these changes in the grasslands under study are discussed. Suggestions are made not to allow heavy grazing or complete protection of grasslands as both of these treatments lead to homogenisation and decrease in plant diversity which is a great threat to the community as a whole.

030 Ghosh, A. N. 1990. **Grassland vegetation in the Himalayan region of India: a review.** Rome: FAO. Forestry Dep. Policy and Planning Service. 98p.

Keyword(s): Grassland ecology / Himalayas / Grasslands / India

Call No: 633.2 GHG

Lang: En

Rapid deterioration of the Himalayan ecosystem due to pressure from the human and livestock population has been a matter of serious concern to all the countries of the region, i.e. Bhutan, Nepal, India, and Pakistan. Judicious utilisation of the natural resources such as soil, water, forests, grasslands, etc. is extremely important for the preservation of the ecosystem on which prosperity of the nations depends. Research has been carried out on sub-alpine, temperate, sub-tropical grasslands fairly extensively in one or two countries of the region but most of the results lie scattered in the reports of the different institutions and in papers published in various journals. This review is presented, in a consolidated form, updated information on the research done on temperate and alpine grasslands and related forage species in the Himalayan region of India and indicates those areas in which research work should be intensified. Additionally, geology, climate and floristic composition of the Himalayan region is described. Similarly, grassland characteristics, productivity of natural grasslands and their performances of the temperate and subtropical species in the Himalayan region are discussed.

031 Gupta, B.; Singh, R.; Verma, R. K. 1994. **Biomass fluctuations in grazing lands around Shimla, Himachal Pradesh.** *The Indian forester* 120(6):488-499

Keyword(s): Grazing lands / Energy resources / Biomass / India, HP, Shimla

Call No: 634.9 INF

Lang: En

The study of biomass production in a community leads to a deeper insight into the behaviour of vegetation and quantity of matter produced in a given interval under prevailing climatic conditions. In the present paper results for the study on biomass fluctuations following grazing is presented. The plant biomass is reported to vary from month to month and season to season on controlled and grazed sites. According to the report, seasonally, the above ground biomass was reported to be maximum in rainy season followed by summer and winter. Below ground biomass was reported to be maximum in winter, followed by monsoons and summer. Among different plants, grasses were reported to be the major contributors to the community biomass.

032 Jodha, N. S. 1988. **Fuel and fodder management systems in the arid region of western Rajasthan.** Kathmandu: International Centre for Integrated Mountain Development. 47p.

Keyword(s): Fuelwood / Feed crops / India

Call No: 333.9 JOF P

Lang: En

Rangelands - Ecology, Management and Development

This document highlights the features of natural resources base of the region with focus on scarcity and instability of biomass production in the arid areas; societal responses to the problem at different levels; the farmer's strategies to manage fuel and fodder situation; and recent changes accentuating the biomass scarcity. Finally, the lessons from past experience and possible approaches to handle the problem by the identification of some components for future strategies to restore balance between demand and supply of fuel and fodder for the arid region have also been discussed.

033 Kumar, A. 1995. **Germplasm survey and identification of specific fuel and fodder yielding wild shrubs of high altitude Garhwal Himalaya.** In Singh, R. B.; Haigh, M. J. (eds.) Sustainable reconstruction of highland and headwater regions: proceedings of Third International Symposium on Headwater Control held on 6-8 Oct 1995 in New Delhi, India. New Delhi: Oxford & IBH Pub. 581-588p.

Keyword(s): *Germplasm conservation / Garhwal Himalayas / Plant resources / Genetic resources / Deforestation / India, UP, Garhwal*

Call No: 551.48 SIS **Lang:** En

Report on extensive survey of high altitude Garhwal Himalayas carried out to identify wild shrubs growing in the area and to record its occurrence, abundance, growth and reproductive details along with its information regarding possibilities of its utilisation as fuel and fodder by the rural people is presented in this paper. Identified species are categorised according to its distribution and utility. Emphasis is given on fast growing woody shrubs forming compact vegetal cover on degraded wastelands, growing in adverse climatic/edaphic conditions and having deep penetrating root systems. Based on the survey and plantation analysis various recommendations have been suggested.

034 Melkania, N. P.; Tandon, J. P. 1988. **Investigation on the natural grasslands and their degradation and regeneration in Kumaon Himalaya.** In Chadha, S. K. (ed.) Himalayas: ecology and environment. New Delhi: Mittal Publications. 137-167p.

Keyword(s): *Grassland management / Kumaon Himalayas / India, UP*

Call No: 551.432 CHH **Lang:** En

Information on the ecological features and predominance of grasslands along with the gradient of soil and environmental factors is an essential

prerequisite for launching any improvement programme. This paper attempts to generate more extensive information on various aspects of grassland in Kumaon Himalayas selected to represent sites for most of the agro-climatic conditions in relation to the history of their management with a view to develop an appropriate grassland improvement management programme. The paper also emphasises the implications of this information in retrospective and the formation of strategy for future improvement programmes.

035 Nigam, A. K.; Tyagi, D. K.; Gujar, S. M. 1994. **An approach to the management of grasslands in great Indian Bustard areas.** The Indian forester 120(10):908-914

Keyword(s): *Grassland management / Nature conservation / Birds / Species / India*

Call No: 634.9 INF **Lang:** En

This paper presents the management of grassland areas that host the Great Indian Bustard and other endemic species of bird (*Ardeotis nigriceps*) on the Indian sub-continent. This paper focusses on grassland management objectives, existing grassland management practices and improvement of existing grasslands. Additionally, general information on the Great Indian Bustard area and type of grassland and vegetation of the Great Indian Bustard area are given in brief.

036 Poffenberger, M.; Sarin, M. 1995. **Fiber grass from forest land: a case from North India.** In Fox, J. Society and non-timber forest products in Tropical Asia. (East West Center occasional paper: environment, 19). Honolulu, HI: East-West Center. 109-129p.

Keyword(s): *Fibre crops / Grassland management / Pulp and paper industry / Forest management / India*

Call No: 634.9 FOS **Lang:** En

Fibre grasses are important raw materials for India's rural rope-making industries and commercial paper mills. Bhabbar, or sabai grass (*Eulaliopsis binata*), grows abundantly on forest lands in eastern India and in the Shivalik Range, an area stretching from Uttar Pradesh state to the Pakistan border at the base of the Himalayas. This paper explores how grasslands are managed by the Haryana Forest Department (HFD) and how lease-harvesting rights are allocated to contractors and to paper mills. Reactions of the paper mill, of private contractors and that of the Haryana Forest Department (HFD) are also discussed. The paper also chronicles the experiences of the Hill Resource Management Societies (HRMS) in protecting and using grass lease

Rangelands - Ecology, Management and Development

lands under a Forest Department programme to transfer management and exploitation rights to an important non-timber forest product from larger industries and wealthy middlemen to forest communities in order to improve forest management.

037 Rao, A.; Casimir, M. J. 1990. **Perspectives on pastoral economy and ecology in the Western Himalaya.** In Sah, N. K.; Bhatt, S. D.; Pandey, R. K. Himalaya: environment, resources and development. Almora: Shree Almora Book Depot. 386-402p.

Keyword(s): Parasitic diseases / Grassland management / Himalayas

Call No: 551.431 SAH

Lang: En

In this paper, the authors propose to briefly discuss a few of the preliminary results of their multidisciplinary field research in a part of the western Himalayas regarding the perspectives on pastoral economy and ecology in the western Himalayas.

038 Reynolds, V.; Nautiyal, B. P. 1990. **The ecology of grazing and fodder collection in Garhwal north India.** In Sah, N. K.; Bhatt, S. D.; Pandey, R. K. Himalaya: environment, resources and development. Almora: Shree Almora Book Depot. 3-9p.

Keyword(s): Grassland ecology / Fodder plants / India

Call No: 551.431 SAH

Lang: En

In Garhwal, all villages contain a number of cattle, oxen, buffaloes, goats, sheep or mules according to the station of the village in relation to nearby forest. Grazing and fodder collection are related to each other, both being concerned with the maintenance of livestock. This paper presents the problems in human ecology through grazing and fodder collection. The present situation of livestock, grazing and fodder collection in Garhwal is also presented in brief.

039 Sant, H. R. 1988. **Effects of grazing on seed production of grassland species from the upper Gangetic plains of India.** In Agarwal, S. K.; Garg, R. K. (eds.) Environmental issues and researches in India. Udaipur: Himanshu Publications. 129-135p.

Keyword(s): Grazing lands / Grasslands / Seed production / India

Call No: 304.2 AGE

Lang: En

Grasslands are economically valuable for man. The population in some species increases with greater degree of grazing intensity due to the fact that the

competition from those species which are palatable is reduced. This paper discusses the effect of grazing on seed production of grassland species from the upper Gangetic plains near Varanasi, India. Seed output in overgrazed field was found to increase in species like *Panicum psilopodium*, *Eragrostis viscosa*, *Dactyloctenium aegyptica*, *Paspalidium flavidum* and *Eragrostis tenella*. The seed productivity of these grassland species was calculated in terms of seed output and the results are discussed with the help of different charts.

040 Santvan, V. K.; Agrawal, H. O. 1993. **Floristic composition of grassland above treeline in north-west Himalaya.** In Dhar, U. (ed.) Himalayan biodiversity: conservation strategies. (Himavikas publication, 3). Nainital: Gyanodaya Prakashan. 245-250p.

Keyword(s): Grasslands / Pasture ecology / India

Call No: 574.5 DHH

Lang: En

The present paper deals with floristic composition above treeline in northwestern Himalayas at Rahla. A total of 79 species, comprising 11 grasses, 7 sedges, 4 leguminous forbs and 57 non-leguminous forbs are reported. *Agrostis*, *Anemone*, *Danthonia*, *Plantago*, *Poa*, *Polygonum*, *Potentilla* and *Fragaria* are included as common genera. The life form spectrum of the flora in the present paper revealed 32.05 per cent geophytes, 29.48 per cent hemigeophytes, 26.29 per cent chamaephytes and 11.53 per cent therophytes. Finally, the paper is concluded by stressing that higher percentage of geophytes and hemigeophytes reveals the effect of environmental severity of alpine region.

041 Shah, S. L. 1991. **Management of grasslands and wastelands for sustainable fodder production in Almora district: some learning lessons of Khulgad Micro-Watershed Project.** In Society for Himalayan Environmental Rehabilitation & Peoples' Action. Livestock development in the Himalayan regions of India. Lucknow: Society for Himalayan Environmental Rehabilitation & Peoples' Action. v.2(155-166)p.

Keyword(s): Grassland management / Waste land / Feed grasses / India, UP, Almora

Call No: 636 SHL

Lang: En

Animal husbandry is an important enterprise in hill districts of Uttar Pradesh. It is well accepted that livestock enterprise cannot thrive without sustainable and adequate fodder supply, which is difficult due to small size of farms and lack of irrigation facilities.

Fodder is, by and large, not cultivated and is collected from forests, grasslands besides agricultural residues. As the livestock population is increasing, the availability of fodder, grasses and leaves is dwindling due to poor management and ecological degradation of the land. In this article an attempt has been made to highlight the fodder production problems at the district level. Some lessons from the Khulgad Micro-Watershed in Almora district are also presented.

042 Sharma, P. D. 1991. **Alpine pastures.** In Sharma, P. D.; Singh, K. Status report on Kinnaur and Spiti catchments of Sutluj river in Himachal Pradesh. Palampur: Himachal Pradesh Krishi Vishwa Vidyalaya. 89-97p.

Keyword(s): Pastures / Alpine ecosystem / India, HP, Kinnaur / India, HP, Lahaul-Spiti

Call No: 551.483 SHS

Lang: En

The alpine pastures constitute the largest area of about 45 per cent of total geographical area in Kinnaur and 18 per cent of total area in Spiti. This paper describes three categories of pastures depending upon climatic conditions found in Kinnaur and Spiti. The nutritional status of these pastures and soil characteristics (morphological and physical) governing their availability is discussed and provides proper recommendation for fertilisation. Special attention is given to various physical characteristics governing the water retention and infiltration behaviour of the soils to discern their role in the hydrological functioning of the mountain ecosystem. Different measures taken for the sustained productivity of the pasture lands is given.

043 Yadav, B. P. S.; Prasad, R. N. 1991. **Grassland resources of eastern Himalayan region.** In Society for Himalayan Environmental Rehabilitation & Peoples' Action. Livestock development in the Himalayan regions of India. Lucknow: Society for Himalayan Environmental Rehabilitation & Peoples' Action. v.2(172-186)p.

Keyword(s): Grassland management / Himalayas

Call No: 636 SHL

Lang: En

The eastern Himalayan region represents an area ranging from tropical plains to temperate and alpine hills. The grassland, forage and feed resources of these hilly areas have a high potential for the intensification of dairy, meat, fur, and wool production, and for the survival of wildlife. In the present communication, an attempt has been made to take into account the grassland and livestock resources for increasing the productivity and some reflection on future prospects of further improvement.

Nepal

044 Agricultural Projects Services Centre / 1979. **Range and pasture production.** In Agricultural Projects Services Centre / South-East Consortium for International Development. Resource Conservation and Utilization Project. Kathmandu: Agricultural Projects Services Centre / Chapel Hill, NC: South-East Consortium for International Development. v3, annex 1c, 136p. Kathmandu: Agricultural Projects Services Centre / Chapel Hill, NC:

Keyword(s): Pastures / Feed crops / Pasture management / Grazing lands / Livestock / Nepal

Call No: 333.7 REC 4

Range and pasture production in the project area is discussed in this paper. Ecological groupings of rangeland and resource present for feeding is described. Recommendation and programme to increase fodder production in resource conservation and utilisation project area is discussed in terms of range management, feed production and development, pasture development programme and its utilisation.

045 Archer, A. C. [1988]. **Nepal: high altitude pastures and their development in the remote border districts - feasibility study and project formulation.** Kathmandu: FAO. 215p.

Keyword(s): Pasture management / Feasibility studies / Pastures / Project design / Nepal

Call No: 333.74 ARN

Lang: En

This report on the high altitude pastures and their development in the remote border districts tends to form an appraisal of the remote region in terms of natural basic resources particularly in relation to the existing nature of the alpine pasture and the complex pasture systems that have been created through the destructions of the natural forest. The impact upon a new forage and fodder development programme in the high altitudinal zones in terms of interrelated projects in research and extension dissemination of information, training programmes and seminars have been discussed.

046 Archer, A. C. 1990. **Pasture and Fodder Development in the High Altitude Zone Project: Nepal - project findings and recommendations.** Kathmandu: FAO / Kathmandu: UNDP. 185p.

Rangelands - Ecology, Management and Development

Keyword(s): *Feed crops / Highland / Pasture management / Nepal*

Call No: 333.74 ARP

Lang: En

The document presents the findings and recommendation of a project carried out for pasture and fodder development in the high altitudinal area. The document concentrates mainly upon three main activities; (a) pasture/rangeland improvement as a means to increase productivity through plant introduction, seed production, livestock control, deferred grazing, incorporation of winter feed into cropping systems, and the investigation of indigenous forage grasses and legumes; (b) reconnaissance survey of pasture/rangeland with an inventory of grazing, natural resources and livestock in the four emergency districts of Humla, Mustang, Sindhupalchok and Dolakha; and (c) in-service training programme conducted by the project. Socioeconomic system of rural communities has also been highlighted regarding the four emergency districts. Finally, recommendation regarding the development of forage and fodder for improving livestock at village level is also given.

047 Basnyat, N. B. 1989. **Pasture and Fodder Development in the High Altitude Zone: report on pasture and rangeland resources in upper Mustang - consultant's report.** Kathmandu: UNDP. 50p.

Keyword(s): *Feed crops / Pasture management / Highland / Nepal, MWDR, Mustang*

Call No: 333.74 BAP

Lang: En

This report is based on a survey of pasture and rangeland resources of upper Mustang. The report evaluates the pasture development work carried out in Mustang district by the regional pasture section and advises some improvements. It also reports on the current situations regarding pasture conditions and livestock feed resources. Livestock movements along the northern border and their potential effects on the pasture and food situation is also reported. Finally, feasibility in Mustang district of using irrigation for crop and fodder production has been investigated. Suggestions are made for the policy that should be implemented by HMG on four main aspects such as: i) improved communication, ii) provide an alternative source of energy, iii) diversify the economy, and iv) promote the agricultural sector. These aspects are fully discussed in the text with specific recommendations for future action.

048 Bauer, J. J. 1989. **Grassland ecology of the Himalayan region: survey manual.** (Nep 85/011 field document, 14). New York, NY: UNDP / Rome: FAO. 8p.

Keyword(s): *Grassland ecology / Himalayas / Nepal*

Call No: 333.74 BAG F

Lang: En

Highland pastures in protected areas are mostly utilised by livestock, either on a seasonal basis or all year round. Heavily utilised areas especially around settlements show severe degradation, which decreases both the carrying capacity for livestock as well as the diversity of species. To conserve grasslands and grassland species as well as to improve living conditions for people within protected areas, a finely tuned balance has to be found between their different needs. This will be attempted with an integrated survey system. This document presents the survey procedure to study grassland ecology of the Himalayan region.

049 Carter, M. G. 1979. **Range management and animal husbandry components.** In Agricultural Projects Services Centre / South-East Consortium for International Development. Resource Conservation and Utilization Project. Kathmandu: Agricultural Projects Services Centre / Chapel Hill, NC: South-East Consortium for International Development. v3, annex 1b, 44p.

Keyword(s): *Rangelands / Livestock management / Feed crops / Pasture management*

Call No: 333.7 REC 4

Range management and pasture development and animal husbandry are indispensable elements of resource conservation and utilisation project. This paper focuses on the range management and animal husbandry components. Physical characteristics of the area are described, as it relates to range management. Project setting and methodology is presented based on the livestock and resource conditions. Project components, area which requires research are discussed and recommendation required for the action plan of the project are also given.

050 Fox, J. 1995. **Non-timber forest products in a Nepali village in 1980 and 1990.** In Fox, J. Society and non-timber forest products in Tropical Asia. (East West Center occasional paper: environment, 19). Honolulu, HI: East-West Center. 37-51p.

Keyword(s): *Forest products / Social conditions / Fodder plants / Livestock management / Nepal, WDR, Gorkha*

Rangelands - Ecology, Management and Development

Nepal, WDR, Gorkha

Call No: 634.9 FOS

Lang: En

Non-timber forest products (NTFPs) generally includes food, medicine, resins, latex, fodder and fibre grasses, wildlife, fuelwood, rattan and other items. In the sal (*Shorea robusta*) forests of northern India and Nepal, however, fodder and fuelwood make up the largest portion of the non-timber forest products. This paper documents differences in forest conditions and changes in the production and collection of non-timber forest products, and seeks to determine what factors have triggered these changes. The paper is based on the study made for non-timber forest products in a village in Nepal in 1980 and 1990. Results for the study made in 1980 for the forest-use practices of a village in the hills of central Nepal indicate that the forests of the village were in poor condition and that the major causes of the degradation were the grazing and fodder collection required for the large livestock population then. But, resurvey for the forest condition and forest-use practices in 1990 gave much better results than in 1980, which have been illustrated in this paper. Bhogteni, a village on the northern side of Gorkha has been taken for the study.

051 Harrison, A. 1989. **Results of a trial to investigate the effect of compost in the potting mixture of Dudhilo.** (LAC technical paper, 12). Pokhara: Lumle Agricultural Centre. 7p.

Keyword(s): Composts / Fodder plants

Call No: 630.721875 LUA 44

Lang: En

Obtaining sufficient forest top soil, which is the recommended medium for nursery work in Nepal, is a problem in many nurseries. One way of improving poor quality soil is to add well-potted compost. This will improve the physical structure of the soil as well as its nutrient status and can also bulk-up meagre supplies of potting mixture. In extreme cases, compost and sand could be used to create a suitable soil. This document presents the result of a trial to investigate the effect of compost in the potting mixture of Dudhilo.

052 Heuch, J. 1986. **The work of Lumle's Forestry/Pasture Section.** In Robinson, P. J. Proceedings of the First Meeting of the Working Group on Fodder Trees, Forest Fodder and Leaf Litter held on 23 Jun 1986 at Kathmandu, Nepal. (FRIC Occasional paper, 3/87). Kathmandu: Nepal. Ministry of Forest. Forest Research and Information Centre. 10p.

Keyword(s): Feed crops / Forestry / Institutional framework / Pastures / Nepal, WDR, Kaski

Call No: 636.08551 ROP P

Lang: En

This short note covers a brief information on the work done by Forestry/Pasture section of Lumle for the improvement of fodder quality.

053 Miller, D. J. 1984. **Range/pasture and livestock resources in selected panchayats of Myagdi and Mustang districts, Nepal.** Kathmandu: Resource Conservation and Utilization Project. 50p.

Keyword(s): Rangelands / Pastures / Livestock management / Nepal, WDR, Mustang / Nepal, WDR, Myagdi

Call No: 636.085 MIR

Lang: En

Reports based on the range/pasture and livestock resources in selected Panchayats of Myagdi and Mustang districts of Nepal are compiled in this volume. It consists of four parts, first part presents the report on the range/pasture and livestock resources found in Myagdi district including data of six Panchayats belonging to that district. Observations and recommendations regarding the existing department of livestock development and animal health through pasture development programme in Myagdi District are presented in the second part. The report for range/pasture and livestock resource and management and recommendations for Lete and Kenja Panchayats in lower Mustang district is included in the third part. A report of the observations and recommendations regarding the existing development of livestock development and animal health obtained through range/pasture development project in Mustang district are presented in the fourth part.

054 Miller, D. J. 1993. **Rangelands in northern Nepal: balancing livestock development and environmental conservation.** Kathmandu: United States Agency for International Development. 104p.

Keyword(s): Livestock / Rangelands / Grasslands / Pasture management / Nepal

Call No: 333.74 MIR

Lang: En

The high elevation rangelands of Nepal have supported livestock and herders for thousands of years while sustaining a unique flora and fauna. Despite their extent and importance, the ecology of the grazing lands of Nepal is still poorly understood. Within the high-elevation rangeland region of northern Nepal there are vast differences in range resources, biodiversity, indigenous people, and livestock production systems and a range of causalities that operate in the ecosystem. These extreme variations make assessments of the

Rangelands - Ecology, Management and Development

rangelands and pastoral production systems difficult, and complicate the development planning process and the formulation of sustainable, improved livestock production management strategies and conservation programmes. This report focusses primarily on major issues and options for the range livestock sector and environmental conservation in the rangelands of northern Nepal.

055 Numata, M. 1985. **Ecological basis of pasture management in the Himalayas: case studies from Eastern Nepal.** In Singh, T. V.; Kaur, J. (eds.) *Integrated mountain development.* New Delhi: Himalayan Books. 217-238p.

Keyword(s): *Pasture management / Ecology / Himalayas / Nepal*

Call No: 574.5264 SIM

Lang: En

In the humid Himalayas, particularly in eastern Nepal, there are many semi-natural pastures and meadows widely distributed from lowlands to the highlands. This paper presents the process of deterioration of primeval nature in a developing country like Nepal from the viewpoint of applied ecology and its management. A case study from eastern Nepal is presented, laying stress on the vegetational analysis of semi-natural grasslands of that area. Environmental factors of pastures and the vertical distribution of grasses and grasslands are briefly described. Additionally, the structure, dynamics and management of grassland vegetation have also been elucidated. Some examples of the floristic composition of grassland vegetation and the altitudinal distribution of grasses as well as tree species are given in tabulated form.

056 Numata, M. 1990. **Semi-natural pastures and their management in eastern Nepal.** In Numata, M. *Ecology and conservation: the selected papers.* Tokyo: Meiseikai. 138-148p.

Keyword(s): *Pasture management / Pastures / Nepal, EDR*

Call No: 574.5 NUE

Lang: En

Ecology of semi-natural pastures in the humid Himalayan region of eastern Nepal has been studied by the Chiba University team. From the subtropical mixed forest in the lowland to the cold temperate evergreen needle-leaved forests, all altitudinal zones are potentially forest zones. The subalpine zone is reported to be occupied by scrubs of juniper and rhododendron. These woody vegetation zones are widely reported to change to semi-natural pastures for domestic animals. The altitudinal grassland zones are classified into two types; upper, cool type and lower, warm type. In the lowland, it is reported that

the people stress rice cultivation, while in the highlands, stress is on animal husbandry. The grass cover after slash and burn agriculture in the inhabited area and on burnt fields of forests and alpine scrubs are used for grazing. The semi-natural pastures and their management in the eastern Nepal has been examined and presented in this paper. The author has proposed the measurement of the degree of succession and the index of grassland condition as the best method to judge the conditions and trends of pastures.

057 Numata, M. 1990. **The sustainable use of semi-natural pastures in the humid Himalayas.** In Numata, M. *Ecology and conservation: the selected papers.* Tokyo: Meiseikai. 149-156p.

Keyword(s): *Pasture management / Himalayas*

Call No: 574.5 NUE

Lang: En

In humid Himalayan areas, particularly in eastern Nepal, the mountainous land higher than upper limit of rice cultivation is mainly used for the grazing of yak and dzo. Paddy is cultivated in low altitudes, and animal husbandry and upland field agriculture in high altitudes. The importance of animal husbandry in agriculture in a broad sense increases, particularly in high altitudes. There are many semi-natural pastures and meadows widely distributed from the lowlands to the highlands. The sustainable use of semi-natural pastures in the humid Himalayas is discussed in this paper in two parts. The context of diagnosis of the condition and trend of pastures is described in the first part, while the second part discusses the diagnosis of the condition of pastures in eastern Nepal.

058 Paudyal, D.; Bauer, J. J. 1988. **A survey of wildlife, grasslands and pastoral systems of the upper Hinku and Hongu valleys, Nepal.** (Nep 85/011 field document, 12). New York, NY: UNDP / Rome: FAO. 118p.

Keyword(s): *Grasslands / Pastures / Wildlife conservation / National parks / Nepal*

Call No: 333.78 PAS

Lang: En

This is a survey report of wildlife, grasslands and pastoral systems of the upper Hinku and Hongu valleys of Nepal. The report first describes the pastoral systems, habitats, livestock, and wild ungulates, grassland, diversity of grasslands, and grassland productivity of the Hinku-Hongo region. Then, the record of livestock density, factors influencing the condition of grasslands, wildlife and species richness and forest condition of the Hinku-Hongo region, is described. Brief information on major crop production, trade and crafts, hunting, tree fodder, fuel consumption and demand, medicinal plant gathering, tourism, religious sites and

059 Rajbhandari, K. R. 1991. **Grassland ecology and preliminary studies of bamboos in the Apsuwa valley.** (Makalu-Barun Conservation Project working paper, 13). Kathmandu: Makalu-Barun Conservation Project / Franklin, WV: Woodlands Mountain Inst. Mount Everest Ecosystem Conservation Program. 24p.

Keyword(s): *Grassland ecology / Bamboos / Development projects / Nepal*

Call No: 574.5 RAG 50 **Lang:** En

Grasslands are found in all the ecological zones in the Apsuwa Valley of eastern Nepal but there is little research on the grassland vegetation of this area. This report of the grasslands and bamboos of the Apsuwa Valley is based on a field survey carried out in 1989. It assesses the types, diversity and dynamism of grassland vegetation, and identifies effect of human activities upon it. It also reports bamboo types, their use, and ecology. The report shows that signs of overgrazing or erosion in the grasslands are not prominent, and that there are very few or no legume species in the grasslands. Great scope for increasing bamboo production by opening the present inaccessible areas and by planting bamboo in suitable village or forest areas have been recommended.

060 Watanabe, T. 1994. **Soil erosion on yak-grazing steps in the Langtang Himal, Nepal.** Mountain research and development 14(2):171-179

Keyword(s): *Soil erosion / Human activity / Grazing lands / Himalayas / Nepal*

Call No: 551.432 MOD **Lang:** En

Large number of livestock such as yaks, cattle, sheep, and goats are grazed in the mountain areas of the Himalayas. Transhumance, a traditional form of mountain pasturing, often results in the development of so called 'terraces' or stepped slopes, and those slopes lead to shallow soil erosion. As an initial step, this paper focusses on the problem of soil erosion caused by yak grazing in the Langtang Valley of Nepal Himalayas. First the origin of the stepped slopes is examined using a model of Howard and Higgins (1987), and then the rates of soil erosion and denudation on the stepped slopes are estimated. Finally, the contribution of the soil erosion to sedimentation in the lower plains have been discussed.

Pakistan

061 Abdul Wahid Jasra; Arshad Ali; Munnawar Ahmed Sial. 1993. **Restoring rangelands for**

improving livestock production in Pakistan. Asian livestock 18(6):65-67

Keyword(s): *Pasture management / Livestock / Animal production / Pakistan*

Call No: 636 ASL **Lang:** En

This article describes the major rangeland types found in Pakistan and discusses the current status of these rangeland resources. The main causes for deterioration of these resources are also discussed. Suggestions required for future interventions are briefly illustrated, and management, resource policy, extension and education, and rehabilitation by plantation are emphasised.

062 Ch. M. Anwar Khan. 1971. **Range management in Hazara district: North West Frontier Province.** (Publication, 64). Peshawar: NWFP University of Peshawar. Board of Economic Enquiry. 116p.

Keyword(s): *Grassland management / Rangeland soils / Pakistan*

Call No: 574.52643 CHR **Lang:** En

Rangelands constitute important watersheds providing natural habitats to wildlife in Pakistan, and also play a vital role in the provincial as well as the national economy. This report presents a detailed analysis of socioeconomic patterns, range use and other land use patterns, classification of land resources on 'ecosystem-approach', current state of productivity of major range types, various technical aspects of each eco-zone and suggests concrete measures and strategies for future development of rangelands in the Hazara District of Pakistan.

063 M. Shabbir Baig. 1981. **Vegetation classification for evaluation of rangelands in arid zones.** Lahore: Pakistan. Ministry of Food and Agriculture. Soil Survey of Pakistan. 57p.

Keyword(s): *Vegetation / Rangelands*

Call No: 333.335 MSV **Lang:** En

The present paper deals with vegetation which is an integral part of the range ecosystem. It therefore, provides information on forage production and grazing capacities of the rangelands so essential for their evaluation and sound management planning. A number of plant communities including four associations of two alliances at the higher level and seven sub-associations, four variants and two sub-variants at the lower level, have been identified. Comprehensive and conclusive associations-wise tables showing description of plant community, species composition, their palatability and their ecological status, range problems and solutions as well as relevant landscape profiles, are given. A

Rangelands - Ecology, Management and Development

phytosociological table, presenting thirteen phytosociological groups of four plant associations as well as depicting their environmental set up is also included. A vegetation landuse map, giving the distribution and extent of plant communities too, is appended. Forage production, both actual and potential, as well as grazing capacities calculated from the clipping data from grazed and fenced areas as also palatability of plants in different landscape units provide the basic data for rangeland evaluation.

064 M. Shabbir Baig. 1981. **Vegetation classification for evaluation of rangelands in arid zones.** (Pakistan soils bulletin, 13). Lahore: Pakistan. Ministry Food and Agriculture. Soil Survey of Pakistan. 54p.

Keyword(s): Rangelands / Vegetation / Pakistan

Call No: 574.52643 MSV

Lang: En

In the ecological and phytosociological survey of Quetta-Pishin, number of plant communities including four associations of two alliances at the higher level and seven sub-associations, four variants and two sub-variants at the lower level, have been identified and presented in this paper. Comprehensive and conclusive associations-wise tables showing description of plant community, species composition, their palatability and their ecological status, range problems and solutions as well as relevant landscape profiles are given. A phytosociological table, presenting 13 phytosociological groups of four plant associations as well as depicting their environmental set up, is also included. A vegetation landuse map, giving the distribution and extent of plant communities too, is appended. Forage production, both actual and potential, as well as grazing capacities calculated from the clipping data from grazed and fenced areas as also palatability of plants in different landscape units provides the basic data for rangeland evaluation.

065 Noor Mohammad. 1984. **Management of Dera Ghazi Khan rangelands: prefeasibility report.** Islamabad: Pakistan Agricultural Research Council. 38p.

Keyword(s): Pasture management / Rangelands / Pakistan, NWFP, D. G. Khan

Call No: 574.52643 NOM P

Lang: En

This document presents the pre-feasibility report for the study made for management of Dera Ghazi Khan Rangelands. The report is divided into four broad chapters. The first chapter deals with bio-geo environment of the study area. The second chapter focusses on the management of rangeland and the third chapter discusses the rangeland improvement operations. The livestock production and marketing is

discussed in the last chapter, followed by brief conclusions.

066 Noor Mohammad. 1989. **Rangeland management in Pakistan.** Kathmandu: International Centre for Integrated Mountain Development. 193p.

Keyword(s): Rangelands / Pasture management / Pakistan

Call No: 333.74 NOR

Lang: En

This book highlights major constraints and problems encountered in the management of rangelands in Pakistan and provides a comprehensive review of the range research and development activities carried out in Pakistan. Covering over 60 per cent area of the country, the range resources are discussed according to their ecological potential. Range improvement practises such as forage germplasm evaluation, reseeding, sand dune stabilisation, soil and water conservation, range fertilization and burning are discussed. Important range grasses, legumes and fodder trees are recommended for large-scale planting. A range resource evaluation and utilisation model is described as a case study. The study of range livestock production systems is emphasised. Finally, future strategy for the management of rangelands in Pakistan is presented.

067 Noor Mohammad; Nasir M. Butt. 1994. **Range management: a solution to desertification.** Progressive farming 14(1):3-10

Keyword(s): Desertification / Rangelands / Grassland management

Call No: 631.05 PRF

Lang: En

The arid rangelands of Pakistan are degrading at an alarming rate due to their misuse for the past several centuries. Over-grazing has resulted in disappearance of vegetative cover from large area leaving bare soil prone to wind and water erosion, a key element to desertification. Measures for combating desertification includes management of rangelands, practising grazing management principles, and range improvement practices including water harvesting techniques, which discussed in this paper.

068. Pakistan Forest Institute. 1966. **First West Pakistan Range Management Conference: proceedings of the conference held on 5-7 Oct 1966 at Peshawar.** Peshawar: Pakistan Forest Institute. 166p.

Keyword(s): Feed crops / Grassland management / Pasture management / Rangelands / Pakistan

Rangelands - Ecology, Management and Development

Call No: 634.9 WEP

Lang: En

Range management is the scientific management of rangelands for continuous maximum production of forage and livestock, consistent with the use of land for other purposes. Specifically, it is the management of natural vegetation for the production of livestock. The present generation is faced with the problem of struggle against hunger and want and must harness all the natural resources hitherto neglected. The proceedings of the first conference on 'West Pakistan Range Management', includes 24 papers discussed during the conference, along with discussions made in the economic development of West Pakistan through livestock production.

Other Areas

069 ESCAP. 1994. **Range management manual for Asia and the Pacific.** Bangkok: ESCAP. 98p.

Keyword(s): Rangelands / Manuals / Grazing lands

Call No: 333.74 ECR

Lang: En

The Asian and the Pacific region exhibit a highly diversified ecological as well as socioeconomic setup. It is primarily a farming region which is home to 70 per cent of the global agricultural population on just 30 per cent of the total arable land. This together with a rapidly growing population, has necessitated the onerous task of keeping food production ahead of the population growth, considered a major challenge in the Asian and the Pacific region where only a fourth of its soils are suitable for crop cultivation without serious limitations. This manual focuses on environmentally sound and sustainable development of rangelands and pastures which covers over 50 per cent of the land area of the region. They offer great potential for increasing food production from livestock resources. The manual has been divided into three major parts. The first part reviews the extent and type of range resources, their management techniques, productivity, and community participation in their sustainable development. The second part covers a cross-section of model case studies undertaken in the region which provide useful insight into increasing productivity while maintaining the sustainability of the ecosystems. In its third part, the manual discusses the range assessment and monitoring methodologies in rangeland ecosystems of the Asian and the Pacific region so that appropriate and timely action can be undertaken before an ecosystem reaches an irreversible stage.

070 Kennedy, P. 1989. **Monitoring the vegetation of Tunisian grazing lands using the**

normalized difference vegetation index. Ambio (a journal of the human environment) 18(2):119-123

Keyword(s): Vegetation / Grazing lands

Call No: 304.2 AMB

Lang: En

This paper investigates the utility of advanced very high resolution radiometer and normalised difference vegetation index data for regional and local scale vegetation monitoring in Tunisia, a geographical area new to this type of research. A quantitative comparative analysis has also been undertaken to establish the relationship between ecological variables recorded at 22 study sites in the field and satellite derived the normalised difference vegetation index. The relationship between normalised difference vegetation index and monthly rainfall is also analysed for four selected study sites.

071 McIvor, J. G.; Chen, C. P. 1985. **Tropical grasses: their domestication and role in animal feeding systems.** In Blair, G. J.; Ivory, D. A.; Evans, T. R. (eds.) Forages in Southeast Asia and South Pacific Agriculture: proceedings of an International Workshop held on 19-23 Aug 1985 at Cisarua, Indonesia. Canberra: Australian Centre for international Agricultural Research. 55-60p.

Keyword(s): Tropical zones / Grasses / Animal feeding

Call No: 633.2 BLF

Lang: En

Grasses are the most important feed source for domestic herbivores. Grasses occur in almost all environments and are particularly prominent in the semi-arid tropical areas forming possibly the dominant component of natural vegetation. In this paper, the role of grasses (both native and introduced) in animal feeding systems in southeast Asia and the southern Pacific have been examined, and how the effectiveness of this role can be increased. Although grass seeds may be important in some animal diets, grasses as herbage plants either grazed *in situ*, or harvested by a cut and carry system has been concentrated. Emphasis has been placed on experiences obtained in Australia but relevant studies elsewhere in southeast Asia and the southern Pacific region are included.

Africa

072 Skoupy, J. 1988. **Developing rangeland resources in African drylands.** Desertification control bulletin (17):30-36

Keyword(s): Vegetation / Rangelands / Dry farming / Africa

Call No: 574.9 DEC

Lang: En

This paper briefs out different ways and means of developing rangeland resources in Africa drylands, keeping in view the production of rangelands, live population and the carrying capacity. For the development of rangeland resources, in the controlled extension of water points, pastoral grazing strategies, and planting of trees and shrubs have been emphasised. And for the best results, reseeding of range, education, training and research has been emphasised. Additionally, natural condition and the current situation of desertification is also highlighted.

Asia

073 Spring, A. 1990. **Rangeland management in Australia.** ESCAP environment news 8(2):10-12

Keyword(s): *Pasture management / Rangelands / Australia*

Call No: 304.2 ESE

Lang: En

This article presents the report on 'Rangeland Management in Australia' presented at the regional seminar-cum-study tour. It presents the overall activities of the seminar and brief information on the rangelands in Australia and some of the main recommendations made by the participants at the end of the study tour.

North America

074 Heady, H. F.; Bartolome, J. 1977. **The vale rangeland rehabilitation program: the desert repaired in South Eastern Oregon.** Portland,

OR: U. S. Dep. of Agriculture. Pacific Northwest Forest and Range Experiment Station. Forest Service. 139p.

Keyword(s): *Vegetation / Grassland management / Rehabilitation / United States*

Call No: 333.7416 HEV

Lang: En

This report evaluates, discusses the initiation, execution, and outcome of an 11-year large-scale rangeland rehabilitation programme on public domain lands in southeastern Oregon, administered by the Vale, Oregon, District of the Bureau of Land Management (BLM). The report also presents the history of land use in the district, some practical politics of land management, multiple use relationships, impacts of range rehabilitation on many parts of the rangeland ecosystem, community reactions to the programme, and economics of rangeland rehabilitation. Sage brush in combination with two grasses, the native perennial blue bunch wheatgrass and the annual cheatgrass, and is reported to dominate the vegetation on 90 per cent of the area of the district. The destruction of the vegetation, the pattern of destruction, and present range condition are inferred. Several terms are defined briefly to clarify their use in this document. Rangeland refers to the land and its resources of soil, vegetation, and wild animals. Rangeland management means land management for all purposes. Livestock management principally concerns the movement and husbandry of domestic animals. Wildlife includes game, fish and other wild animals. Animal unit month (AUM) refers to a mature cow, with or without a calf, grazing for 1 month, or its equivalent in other kinds and classes of livestock.