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EVALUATION OF MULTIPURPOSE FODDER TREES IN NEPAL

A thesis submitted in partial fulfilment
of the requirement for the degree of
Doctor of Philosophy (PhD)

**in
Forestry**



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Abstract

This PhD thesis consists of nine chapters describing aspects of the subsistence farms of western Nepal in general, and a need-based evaluation of multipurpose fodder trees (MFT) as a source of dry-season forage for ruminants in particular, as a basis for mitigating the current high rate of land degradation and loss of productivity in livestock production systems in the region. Understanding the complex farming systems that provide a living for 65% of the 27.1 million people in Nepal is the key to designing effective programmes of research and development. Evaluation methods include review of past work, farmers group workshops to identify current practice in the use of MFT in Nepal, studies on biomass production of *Artocarpus lakoocha* and *Ficus glaberrima* trees older than 50 years in Nepal and the propagation of *F. benjamina*, comparison of the feeding preferences of sheep for alternative browse species, and study of the nutritive value of alternative forage diets for lactating buffalo.

Reviews showed 2.2 million cattle and 1 million buffalo are an extra burden to steep land where productivity is declining at the rate of 1.25% per year. Indigenous knowledge identified *Ficus glaberrima* with its three varieties (Maghe, Chaite and Jethe), *A. lakoocha*, *F. benjamina* and *Bassia butyracea* as the best four MFT for renovating degraded lands. A survey study showed significantly higher dry matter (DM) production by *F. glaberrima* than *A. lakoocha* (154 vs 91 kg DM /tree/year) during dry periods at low altitude (800 - 1000m). There was no significant difference in production of fat - corrected milk (FCM) between buffalos eating *A. lakoocha*, *F. glaberrima* or a diet of 53% straw and 47% *F. glaberrima* (DM basis). Metabolisable energy balance (MJ ME/day) was greater in *Artocarpus* than *Ficus*, with the mixed diet intermediate (+1.60, -0.34 and -12.94 MJ ME/buffalo/day respectively, relative to requirements, P=0.0318). When fed together in an indoor trial, poplar (48% = 106 g DM/sheep/day) and willow (43% = 95 g DM/sheep/day) were preferred to *Ficus benjamina* (8% = 18 g DM/sheep/day) by sheep, reflecting the greater maturity and structural strength of leaves of *Ficus*.

These results are used to develop recommendations for choice of MFT species and management strategies to improve the sustainability and productivity of livestock systems incorporating fodder trees.

Keywords: *Artocarpus lakoocha*, *Ficus glaberrima*, *Ficus benjamina*, rice straw, buffalo, sheep, metabolisable energy, multipurpose fodder trees.

Dedication

This PhD thesis is dedicated to Professor John Hodgson,
for his unconditional love and effort to develop pasture
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Abbreviations and Glossary

ADP	Asian Development Bank
AGDP	Agricultural Gross Domestic products
CBS	Central Bureau of Statistics
DFAMS	Department of Food and Agricultural Marketing Services
DLS	Department of Livestock Services
DOF	Department of Forest
DSWC	Department of Soil Water Conservation
FAO	Food and Agriculture Organization of United Nations
FRSC	Forest Research and Survey Centre
HLFFDP	Hills Leasehold Forestry and Forage Development Project
IAAS	Institute of Agriculture and Animal Science
ICIMOD	International Centre for Integrated Mountain Development
IFAD	International Fund for Agriculture Development
INGO	International Non Government Organization
MOAC	Ministry of Agriculture and Cooperative
NARC	Nepal Agriculture Research Council
NBPDP	Northern Belt Pasture Development Program
NEP/85/007	FAO, High Altitude Pasture Development Project
NFGRC	National Forage and Grassland Research Centre
ODA	Overseas Development Administration of British Government
PAC	Pakhribas Agricultural Centre
PTSMF	Pasture Trial and Seed Multiplication Farm
RAS/79/12	FAO, Himalayan Pasture and Fodder Research Network
UNDP	United Nations Development Program
USAID	United States Agency for International Development

