

DESCRIPTION OF THE STUDY AREA⁽⁷⁾

Physiological context

Area location

The Khaling-Kharungla Forest Management Unit (FMU) is located in the south of Tashigang District, between 27° 12' N. Latitude and 91° 31' and 91° 38' E. Longitude (Topo Map No. 78M/12), at elevations of from 2,000 to 2,900m. The National Eastern Highway transects the unit, linking Tashigang with Pemagatshel and Samdrup Jongkhar districts further to the south, and with all other districts of Bhutan to the west and southwest.

⁷Besides the field notes of John Davidson (plant ecologist), the observations of Rebecca Pradhan (botanist) and Tandin Wangdi (plant taxonomist) are also reflected in the descriptions and findings presented here.

⁸In the Bhutanese system, an operational plan which describes the capital and infrastructural investments in roading and logging for each FMU is written following closely the recommendations of a comprehensive management plan. When the FMU Management Plan was written (Chamling 1996), Khaling-Kharungla fell within the Mongar Forest Division. It now falls within Tashigang Forest Division, created in 1998. We have made the correction in this paper.

⁹Much of the study was conducted using rapid rural appraisal (RRA). An RRA topical checklist prepared to guide the field work was modified in the field to reflect on site realities and new knowledge. On RRA methodologies, see Grandstaff and Messerschmidt 1995; McCracken et al. 1988; Messerschmidt 1995.

¹⁰The source of the following description is Chamling 1996, combined with more recent field work and observation.

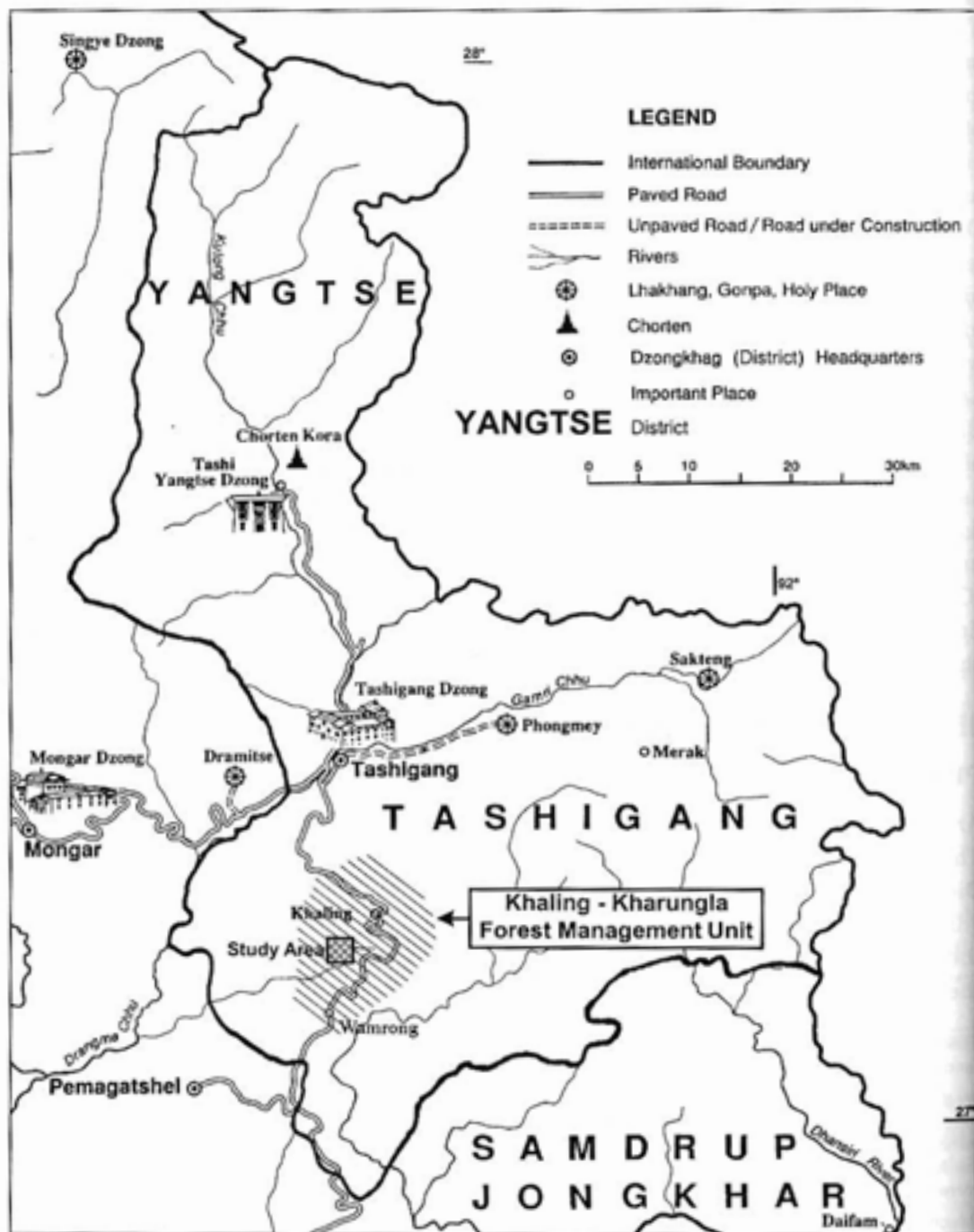


Figure 1: Location of Study Area

The total FMU land area is 7,277ha under various forested and non-forested (agricultural) land uses, including both production and protection forestry under the FMU management and operational plans. Table 1 shows current land-use classes.

Topography, rainfall and soils

The terrain is moderate to steeply sloping and mountainous with deeply incised valleys. The elevation ranges from 1,200 to 3,200m over the whole of the forest unit. Slopes are very steep at higher elevations, becoming more gentle in the middle and lower parts. Within the FMU, 47 % conforms to Slope Class-I (0-45%), 44% to Class-II (45-75%), and the remaining 9 % to Class III (75-100%) and Class IV (>100%).

Rain is the most common form of precipitation in the FMU, with light snowfall in winter. The annual rainfall ranges from 250 to 500cm. The wettest months are May to September - the summer monsoon; the driest are November through January - the bamboo cutting season.

Soils under the hardwood forests are generally well drained sandy loams with a thick layer of humus, generally shallow, ranging from 10-60cm in depth.

Forest types

The Khaling-Kharungla FMU encompasses both cool and warm broadleaved forests, moist and dry, respectively, depending on the local rainfall regime. The cool moist broadleaved forest (most relevant to the bamboo study) ranges from 2,000 to 2,900m. Trees of the family *Lauraceae* and the genus *Eubucklandia* are most abundant, with *Quercus* spp, *Rhododendron* spp, *Castanopsis indica*, *Acer*, *Betula*, *Lindera*, and *Symplocos* spp. This forest is also characterised by dense bamboo thickets, shrubs, climbers, and epiphytes.

Human and animal impacts

In 1996, when the management plan was prepared, there were 205 households within the FMU, with an average of seven persons per household. The total population was 1,435 inhabitants. The local population growth rate is estimated at 2.5% per annum, assuming no significant urban drift effects.

In addition to harvesting bamboo and other AFRs, the main traditional uses of this forest are timber cutting and livestock grazing. In the subsistence economy, the need for timber is small, mainly for new house construction and repairs. For new construction, every Bhutanese

Land-use classes	Area (ha)	%
Forested land		
hardwoods	4421.63	68.88
Pines	250.91	3.91
Scrub	685.12	10.67
Bamboo	119.57	1.86
Shifting cultivation (tseri)	676.97	10.55
Logged	138.62	2.18
in plantation	13.03	0.20
Blank	113.00	1.76
A. Sub-total	6,418.85	88.21
Non-forested land		
under cultivation	779.54	90.89
as pasture	78.18	9.11
B. Sub-total	857.72	11.79
TOTAL (A+B)	7,276.57	100.00

(Based on Chamling 1996: Table 1)

house owner holds a traditional right to cut up to 25 or 30 trees in hardwood (up to 50 in conifers); for house repairs owners are allowed three to five trees every five years. Divisional Forest Office (DFO) staff do the marking, though traditionally the house owner makes his own choice. In the study area, in any one year, only one or two new houses are constructed and a few are repaired. Even adding the occasional construction or repair of a schoolhouse, other public buildings, or a bridge, the impact of traditional timber cutting is small. It is our observation that the greatest potential threats to the bamboo resources are from commercial logging (based on road access) and livestock grazing.

Commercial logging

Commercial logging operations, managed by the Forestry Development Corporation of Bhutan, began at Khaling-Kharungla in 1998. According to the FMU Operational Plan (DFO 1997), altogether 20 cable lines ("skylines") are planned for harvesting timber over the 10-year plan period. Each line is approximately 1,000m in length, running perpendicular to the slope.

A forest access road is being constructed, linked to the National Eastern Highway near Wamrong (see Figure 2). The access road is expected to reach a distance of 8km during the first 10 years of logging operations. By mid-2000, 2.4km of this road had been completed. Road access facilitates the harvesting of timber and also opens up the resource to other AFR harvesters and contractors from outside the area. A small experimental plantation has been established for regeneration of some of the main species (*Exbucklandia*, *Acer*, and others), and trial plots have been established to determine the best means of regeneration after logging (Davidson 2000).

Livestock grazing

Livestock grazing has a significant effect on the condition of the forest, including the bamboo resources. Inventory records and field observation show that most parts of the FMU are

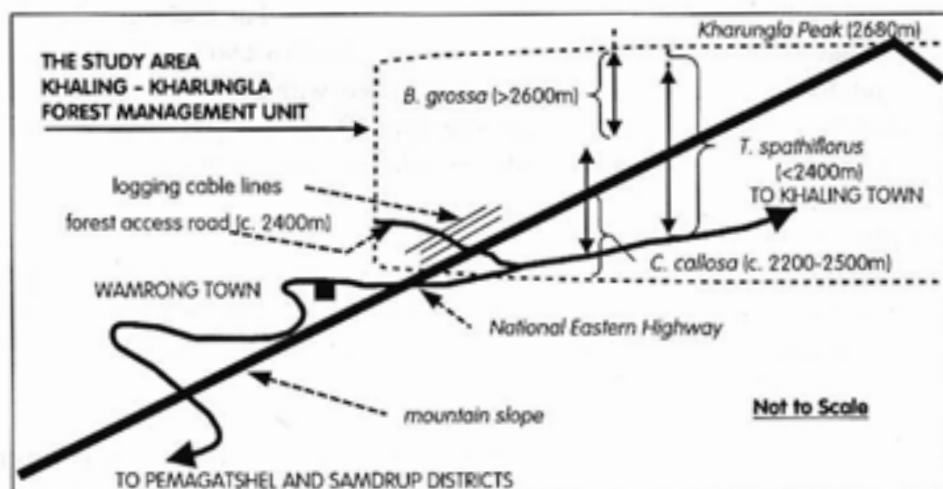


Figure 2: Altitudinal continuum of Bamboo species in Khaling-Kharungla FMU (Lumang Block, Tanshigang district)

grazed by local cattle, with a small influx of migratory cattle and sheep during winter months. As the cattle are left to roam freely in the forest, some damage to tree and bamboo regeneration occurs, mostly from browsing and trampling of seedlings.

Local cattle husbandry plays a vitally important role in the traditional household economy of Bhutan. Most local cattle are kept for draught and milking purposes. The 1996 survey reports 8,152 livestock (or 8,016 livestock units) within the Lumang and Khaling Blocks. Some of these are from seasonally migratory herds of both cattle and sheep belonging to the Brokpa ethnic people who reside in the nearby highland valleys of Merak and Sakteng (in Sakteng Block, Tashigang District).

The heaviest grazing season is from September to May when an estimated total of 3,628 livestock (1,964 livestock units), local and migratory, are pastured here.¹⁰ Under free-ranging conditions, approximately two hectares (5 acres) of natural forest area is needed to support one livestock unit, or approximately 0.5 livestock units per hectare (Chamling 1996; Dorji 1993; Gyamtsho 1992)¹¹.

The FMU Management Plan reports that the local resident animal population appears (arguably) to pose little or no threat to the forest ecosystem. However, more recent observations of tree regenerative capacity and possible displacement of grazing wildlife forms indicate that the combined grazing pressure arising from migratory herds and local animals is beginning to threaten the ecosystem. This competition has precipitated conflict between local and migratory cattle grazers^{10,11}.