

Vegetation Management

At the time that ICIMOD established the Godavari site, the land had been reduced to almost completely degraded forest and shrubland through continuous excessive removal of useful species by people, grazing, and forest fires. The area was once a natural high forest rich in biodiversity and stocked with valuable tree species, but the natural species composition had been replaced through invasion and encroachment by aggressive, hardy, but less useful thorny shrubs, bushes, and weeds. The timber volume was low with very few fuelwood, fodder tree, or other useful species.

ICIMOD embarked on a long-term programme using various assisted natural regeneration techniques to restore the forest. In ten years, the overall biomass more than doubled as did the number of plant species. Agro-forestry models were established, and sightings of wildlife increased. Regeneration is a long-term process and there is still a long way to go in terms of increasing biomass and species diversity – even so the site already has one of the best forests surrounding the Kathmandu valley. This is a living example of what can be done for the degraded forests of the mid hills. Some of the specific approaches are summarised below. By their nature, most of the vegetation management activities are also concerned with biodiversity conservation, as outlined in the sheet on 'Biodiversity'.



Different Approaches in the Different Physiographic Zones (Map Site 2.1a,b)

The site has an elevation range from 1540 to 1800 masl and can be divided physiographically into three ecological vegetation zones – shrub/bushland on the valley floor, shrubland on mixed slopes, and natural forest on steep slopes – and ten vegetation types. Appropriate management systems are being designed and tested for each of these in a research and development programme for assisted regeneration.

The **shrubland on the valley floor** covers an area of 8 ha between 1550 and 1600m. It consists mainly of invaded weed vegetation, thorny shrubs, and bushes with some swampy and dry grassland areas. The climate is sub-tropical and the soil is rich clay loam. The plant nursery, floriculture, sub-tropical and citrus fruits, beekeeping, goat husbandry and angora rabbits trial areas, and the field office buildings are all located in this area.

The **shrubland on mixed slopes** covers an area of 12 ha with slopes of 15-35 degrees between 1600m and 1650m. It mostly contains coppice growth of less useful and unwanted species with a different vegetation type in the gullies to the intervening areas. The slopes are typical of the mountain farming systems in the HKH region, and this zone is suitable for development and/or planting of fruit trees, floriculture, vegetables, medicinal, aromatic and wild edible plants, fodder trees, multi-purpose trees, shrubs, grasses, and nitrogen-fixing species.

The **natural forest on steep slopes** covers an area of 10 ha between 1650 and 1800m. It consists of shrubland in the lower parts, and small trees with a few remnants of the once tall natural forests at higher elevations. The trees are mostly defective or less useful species with little natural regeneration and pole-size stands, and the area is infested with climbers and weeds. This zone is suitable for investigation and establishment of natural forest management; shrubland management; enrichment planting; biomass enhancement; multistoreyed forest systems; selection, selection-cum-improvement, coppice, and coppice with standards silvicultural systems; non-timber forest products; plants with income potential; medicinal and aromatic plants; natural and artificial regeneration; and for conducting research and development on such themes as lopping, harvesting, transport of forest products and their proper use, management regimes, and intensities.

Most of the assisted regeneration techniques are being tried out in the natural forest (Map Site 2.1a) and shrubland (Map Site 2.1b) zones. An attempt has been made to remove less useful species and encourage the growth of more useful species. The aim is to develop a tall natural forest with a higher stock per unit area of more useful trees, to maximise the production of biomass and to protect the environment. Demonstration plots of 0.25 hectares have been established with fodder trees, multi-purpose trees, fuelwood trees, timber trees, and shelter belt vegetation. Many of the forest trees now show vigorous growth, quite often coppicing from heavily lopped tree stems. The wetland part of the shrubland zone on the valley floor is being developed as a wetland 'garden' with a focus on increasing biodiversity (see Sheet 7: Biodiversity).

Alder (Utis) Pollarding (Map Site 2.2)

Pollarding is especially useful for managing trees as part of an agricultural landscape, where harm to crops should be minimised while optimising benefits. The practice of pollarding alders (*Alnus nepalensis*) has been developed and perfected by various indigenous peoples in Northeast India (most notably the Nagas), Northern Myanmar, and Southwest China, and is an important innovation in the shifting cultivation farming system. It is demonstrated at the Centre to show that indigenous practices in shifting cultivation can provide new options to improve agricultural systems across the Himalayas. Himalayan alders are found across the region at elevations between 900m and 2700m from Pakistan and Northwest India, to Bhutan, Northeast India, northern Myanmar, southern China, and into Indo-China. This pioneer species grows naturally or can be planted, even on highly degraded, unstable soils like landslide areas. It provides poles, firewood, and numerous secondary products such as wood for furniture and leaf-litter for composting. It is a non-leguminous species that fixes nitrogen in symbiosis with *Frankia*, and this makes it ideal for enhancing soil fertility even in very acidic soils; its extensive lateral root system helps prevent soil erosion. It is fast growing and harvestable for firewood within 5-7 years. Pollarding starts at eight to nine years at a height of 10m and diameter of 70-80 cm, when the previously smooth bark becomes rough and fissured. The trees are pollarded at 210 cm (7 ft) above the ground – which ensures continued vigorous growth of the tree and strong coppice growth. Pollarding reduces yield reduction of crops because of shading, and provides fuelwood and leaf-litter. The species is long lived, particularly when pollarded systematically; some individual trees have been managed for one to two hundred years.

Biofencing/Live Fencing (Map Site 2.3)

Live fences are lines of trees or shrubs planted on farm or field boundaries that provide protection against cattle and wildlife, act as windbreaks, enrich the soil, provide bee forage, provide shade, and control dust. They are less expensive and more useful than fences made of wood, barbed wire, or stone masonry. Various species have been tested to discover their suitability for use as biofencing plants; nine thorny species have been selected and demonstrated.