Unfavourable structure of forests in the Terai needs immediate management

K. P. Acharya[1]

Forests of high economic value are present mostly in the Terai region of Nepal. Their heavy exploitation continues to generate state revenue and to fulfill the increasing demand of forestry products. Despite being put under a protection system since last two decades, the Terai forests continued to degrade in area and quality. The data of forest resource inventory collected during the preparation of Operational Forest Management Plans (OFMP) from the eight Terai districts covering an area of 105,231 ha were analysed to know the existing forest stand dynamics such as forest type composition and development stages. It is found that the latter is not favourable for sustainable forest management. The highly productive development stages such as pole and middle aged forests contribute small percentages in forest structure composition. The paper argued a need for an immediate action for active forest management.

Keywords : Operational forest management plant, forest composition, forest development stage, sustainable forest management, Terai, Nepal.

Economically valuable forests are present in the Terai region of Nepal. Sal *(Shorea robusta)* is the dominant species, that contributes 43 percent of the total steam volume. Of the estimated 545,900 ha of the Terai forests (FRIS, 1993) about 300,000 ha can be managed as production forest, highly potential for commercial exploitation. However, for the lack of systematic forest management the degradation of quality and productivity of the forests continues.

The present paper analyses the current situation of Terai forest resources in terms of its structure and condition, and emphasises the need for its sustainable management. The forest resource inventory data collected during the preparation of Operational Forest Management Plans (OFMPs) are the source of this paper. The data that were collected using Relascope covering an area 105,231 ha in eight Terai districts of Nepal during the period of 1994-98 (Table) are under the category of production forest as indicated in the OFMPs.

Table : Forest area of eight Terai districts analysed

S. No.	Districts	Area (ha)
1.	Bara	25,959
2.	Bardiya	14,792
3.	Morang	9,141
4.	Nawalparasi	12,392
5.	Parsa	10,110
6.	Rautahat	15,869
7.	Rupandehi	3,825
8.	Sunsari	13,142

Passive forest management practice still continuous in Nepal's Terai. In the past "selective felling" was practiced which basically can be understood as "high grading" or "creaming". Armed force is deputed since the last two decades in all of the Terai districts in order to protect from smugglers.

The lack of systematic forest management is promoting fire hazards, grazing damages and human pressure which are the negative factors for sal regeneration. Such disturbances have not only resulted in gradual depletion of forest quality, gene base, species diversity and growing stock but also loss of forest area. A recent estimate shows that the Terai forests are decreasing at the annual rate of 1.3 percent and the total forest area of Nepal has decreased from 37.4 to 29 percent (DFRS, 1999). whereas the annual investment in forestry sector has increased substantially. Also the revenue is found decreasing from 1992/93 to 1995/96. In terms of investment, revenue collection does not come to par value (FORESC, 1998), and environmental benefits from forests have not been monitised.

Structure of existing forest stands

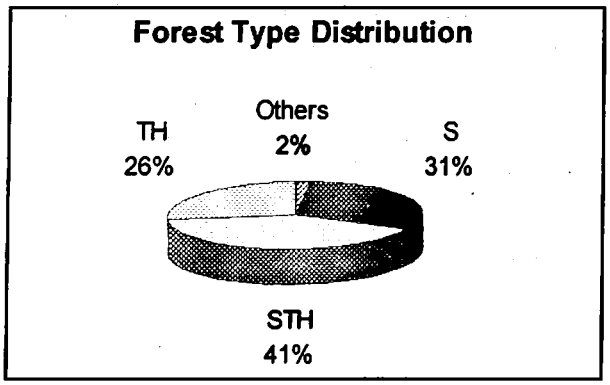
Forest types

Analysis of 105,231 ha of potential production forest of Nepal shows dominant forest types as Sal Terai Hardwood (STH) covering 40.6 percent of the area, whereas sal (S) forest type covers 30.9

[1] Assistant Research Officer, Department of Forest research and Survey. P.O. Box 3339, Kathmandu

percent and Terai Hardwood 26.5 percent. Rest of the forest types found inside the production forest area are Khair-Sissoo, Teak and Eucalyptus that contribute only 2 percent of the area (figure 1) (Sal >59 % of the sal basal area, STH 20-59 % of sal basal area, TH is Terai hard woods and consists of <20 % of sal basal area).

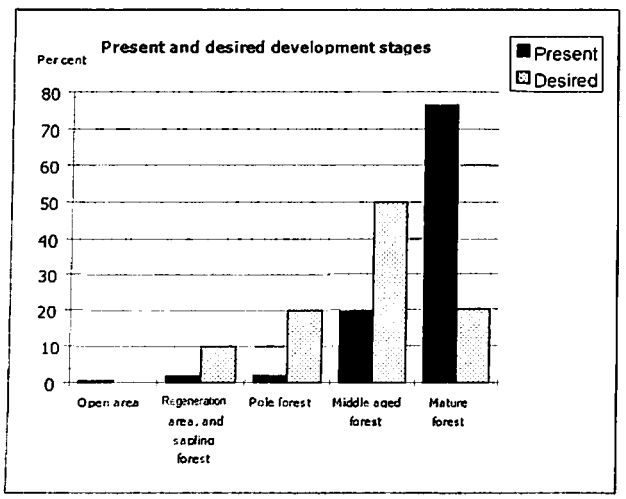
Fig 1: Forest type distribution



Development class

Based on the diameter size of the production forest the development class was assessed to identify its existing distribution in the production forest. It is very interesting to note that regeneration, sapling and pole stages cover only 2.6 percent of the total production forest, which is in fact, contributed mainly by plantation forest. In other words, there is no natural forest area at highly productive development stages like sapling and pole and regenerating stages in the study area. Basically, unproductive mature and over mature development stage occupies 76.4 percent of total production forest (fig. 2).

Fig 2: Present development class as against the desired stage



Site class

The site class was assessed on the basis of the dominant height of the crop in forest compartments into four categories. (Site quality 1 = Dominant height >33 m, Site quality 2 = 27-33 m, Site quality 3 = 21-26m and Site quality 4 = <21m). The site class information from Bara District forest area was not included in the analysis. The analysis of 79,266 ha of forest area of the seven districts shows that dominant site class category was II covering 50.4 percent of area.

Growing stock and growth estimates

The estimated mean stem volume in the production forest area is 166 m^3/ha. The total volume including branches reaches up to 217 m^3/ha. Sal contributes 39.75 percent of stem volume of the existing growing stock. In general, the area shows annual growth of around three percent of the growing stock. These all OFMPs have used Korhonen *et. al.*, (1991) growth model.

Regeneration status

The average natural regeneration in the production forest area is 27,000 seedlings/ha. The highest average was found at Nawalparasi reaching up to 65,000 seedlings/ha. The lowest regeneration was inside the production forest area of Bara and Sunsari district of 12,000 and 17,000 seedling/ha respectively.

Discussions

The lack of systematic forest management has favoured tree smugglers and forest encroachers. If managed properly, the forests can generate significant amount of economic resources for the country, whereas, the present stand dynamics of Terai forests clearly indicate that our present management system has failed to sustainably manage forests.

Once sal was dominant species in sal forest that contributed over 50 percent (Bajracharya, 1986). The previous STH forests are now TH due to selection felling (Rautianein, 1994). It can be inferred that the over exploitation of this species has gradually changed sal forest to STH and subsequently TH. If present trend continues, the

TH could be the dominant vegetation type in the Terai.

The present composition of different development stages is highly unfavourable for a sustainable forest management. At present, not only the highly productive middle aged stage contribute small proportion but also young sapling and pole stages, which must have contributed highest proportion are virtually absent. Sharma and Suoheimo (1995) found that 45-46 percentages of tree are affected by the rot diseases in Makawanpur and Rautahat districts. The dominance of site quality 4 indicates that best quality trees have already been removed from the forest. This situation could have been resulted either in zero or extremely low annual increment of the growing stock.

No sufficient data on regeneration potential of the sal forest are yet available for the Terai, however there is profuse amount of regeneration for second generation crop (Acharya, 2000; Tamrakar, 1995). If the canopy is opened along with controlling fire and grazing (Acharya, 2000) the suppressed regeneration grows up quickly. Champion (1933) reported that natural regeneration areas become established through protecting forest fire in North India.

Works on regenerating new and better crop should be initiated as soon as possible for there is an indication that newly regenerated crop from heavily stressed and degraded forest is developing weak and stressed seedlings. These are vulnerable to pest and pathogens and repeated annual fire and grazing, etc. promote fungal infections through the scorched root and collars. Also, as the trend of removing good quality trees continuous, it will also remove good quality gene pool from the forest thereby, ultimately developing inferior quality crop.

The average growth estimate (3 m^3 /ha/yr) of these forest is quite low than its potential considering the Mean Annual Increment (MAI) of 14 m^3 /ha/yr in Manahari of Makawanpur District (Acharya 2000). Amatya and Amatya (1995) predicted an average growth of sal coppice origin, considering the protection year as the plantation year to be 9.7 m^3 /ha/yr. MAIs of 2-9 m /ha in India and 10-20 m3 /ha in Nepal have been reported earlier (Suoheimo, 1995). Based on these findings Forest Management and Utilisation Development Project (FMUDP) has projected that if Nepal's Terai forests were to be managed actively it can generate Nrs 40,000 to 50,000 per ha royalty. whereas, the existing royalty is about 100 per ha (Pesonen, 1994).

The implementation of programmes for regenerating Terai forests may associate with some risks such as wood market, forest encroachment and pressure from environmental activists against regeneration felling. The present forest policy gives priority to the community forestry over commercial management. Therefore, appropriate forest land allocation policy is necessary to implement OFMPs. Besides, sufficient and adequate funding mechanism and decentralised decision making system, strong political commitment are required for successful implementation of the programme. The Nepali foresters should also be able to resist the conversion of forest into other land use forms through managing Terai forest to produce compatible benefit.

Conclusion

Analysis of data of the eight districts indicated that the present forest stand characteristics are not favourable for sustainable forest management. It can be stated that such management system is neither functional nor scientific. It needs a scientific and functional alternative which recognises forest as a renewal natural resource. The active forest management of about 300,000 ha of Nepal's Terai forest which must involve removal of trees as demanded by prescribed silvicultural operations, can earn significant amount of royalty, generate employment and conserve genetic resources.

Formulation of a clear land allocation policy in order to separate forest land into different categories based on management objective is the first pre-requisite. Similarly, formulation of forestry rules and regulations to promote production oriented forest management system and development of effective mechanism to regulate revolving fund as proposed in the Ninth Plan are equally important. Decentralised decision making system and exploring of wood market is essential to derive timely benefit from forest management. Pilot scale testing of OFMP so far prepared, could provide experiences for full phase implementation. In this context, the result of regeneration felling in Manahari is encouraging. The most critical aspect is the political and technical commitments for proper implementation of the progamme.

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