

Tree growth performance in private plantations in Nepal's central Terai region

By Arun Dhakal

Kathmandu Forestry College
arun_dhakal2004@yahoo.com

The forest policy of Nepal places higher emphasis on community forestry development rather than on private forestry. However, farmers of Nepal's central Terai region have long focused on the establishment of private tree plantations, with community forestry generally not having been encouraged in this region. Private forestry can be a viable option for promoting sustainable management of the national forest in the Terai because pressures on the national forest are reduced when farmers get their basic needs (i.e. fuelwood and fodder) from their own private plantations which are grown primarily for commercial purposes.

The main commercial species in central Terai are *Dalbergia sissoo*, *Eucalyptus camaldulensis*, *Gmelina arborea*, *Tectona grandis* and *Anthocephalus chinensis*. Although farmers are commercially motivated, they lack the skills and knowledge to maximize income from their forests. Species' growth rates and market values determine the income that farmers can gain from their plantation investment. However, there have been no studies to assess the growth patterns and performance of these species so that farmers can select the right species and right harvesting age for the best economic return on their investment. This study examined the growth performance of these five economically important tropical timber species in two different types of plantations: bond plantation (plantation along bonds of the cultivated field) and stand plantation.

Private forestry can be a viable option for promoting sustainable management of the national forest in the Terai because pressures on the national forest are reduced when farmers get their basic needs

Methods

Primary data were collected from nine village development committees (VDCs) of Dhanusha district, where Nepal Agroforestry Foundation (NAF) has been working in private forestry promotion for 15 years. Interviews with the private tree growers were conducted to see how beneficial it was to have a forest stand in place of traditional cereal based farming systems. For the market study, five local saw mill operators were consulted to ascertain market trends for these five species. Growth performance of each species in the two plantation types was assessed by measuring diameter and height. Private tree growers having an area of at least five *katha* (about 0.15 ha) were selected for this purpose and every third tree was measured (systematic sampling with random start).

Preferred species

In general, farmers preferred three species in both stand and bond plantations: *D. sissoo*, *E. camaldulensis* and *G. arborea*. *T. grandis* and *A. chinensis* were not preferred in bond plantations since these species had negative shading effects on the major crops. For pole production, farmers gave high priority to *E. camaldulensis* and for timber and fuelwood shifted to *D. sissoo*, *G. arborea*, *T. grandis* and *A. chinensis*.

Farmers' specific preferences varied with plantation objectives. For pole production, *Eucalyptus camaldulensis*



Springing up: Bond plantation of *E. camaldulensis*. Photo: A. Dhakal

was the only species preferred by all private tree growers since it is comparatively taller and has considerably faster radial growth than the other four species under study. When it came to timber production, however, this species was the least preferred. However, the preference of tree growers for other timber species was mixed. A majority of the respondents gave higher preference to *Dalbergia sissoo* followed by *Gmelina arborea* and *Tectona grandis* as second and third respectively. Only farmers with bond plantations considered *E. camaldulensis* for timber due to its faster growth and hence quicker expected economic returns. *Anthocephalus chinensis* and *Tectona grandis* were found to be less preferred for bond plantations since these two species shared comparatively higher crown coverage and bigger leaf surface areas, resulting in heavy shading of the main agricultural crops in these plantations and hence detrimental effects on production.

Farmers' preference for *D. sissoo* as a source of timber has been tempered in the recent past due to die-back caused by a still unidentified organism. Preference has shifted to *G. arborea* gradually because it is reasonably similar to *D. sissoo* in terms of durability, growth pattern and appearance.

Growth performance

The growth performance of the three species used in bond plantations (*D. sissoo*, *E. camaldulensis* and *G. arborea*) or is shown in Figure 1. The bond plantation was found to be beneficial for farmers as all three tree species performed better in bond than in stand plantations. In the bond plantation, *D. sissoo* was second highest in term of DBH growth after *E. camaldulensis* but the same species had a comparatively slower growth rate in stand plantations. While somewhat slower, *E. camaldulensis* was also the tree having the fastest growth in stand plantations (Figure 2). The growth curve of the bond plantation indicated that *G. arborea* had a steady growth pattern over time while *E. camaldulensis* and *D. sissoo* grew somewhat abruptly. In stand plantations, *E. camaldulensis*, *A. chinensis*, *T. grandis* and *G. arborea* grew steadily while *D. sissoo* grew abruptly from age four as in the bond plantation.

Fast eucalyptus

Figure 1. DBH growth curves of 10 year old bond plantations of study species

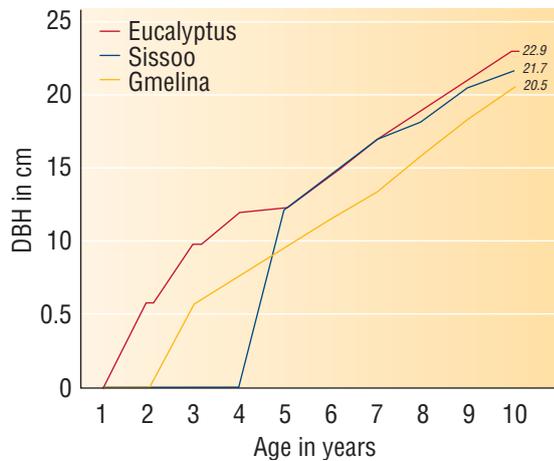
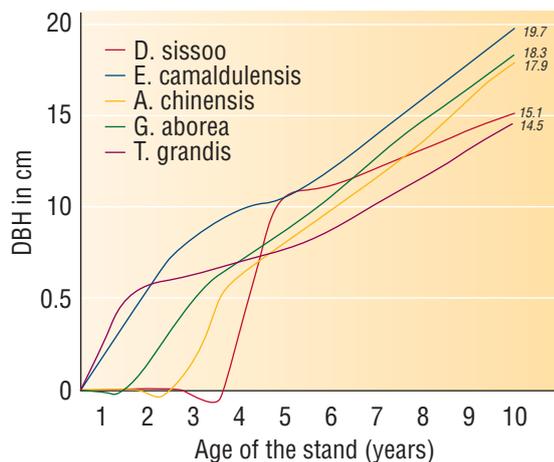


Figure 2. DBH growth curves of 10 year old stand plantations of study species

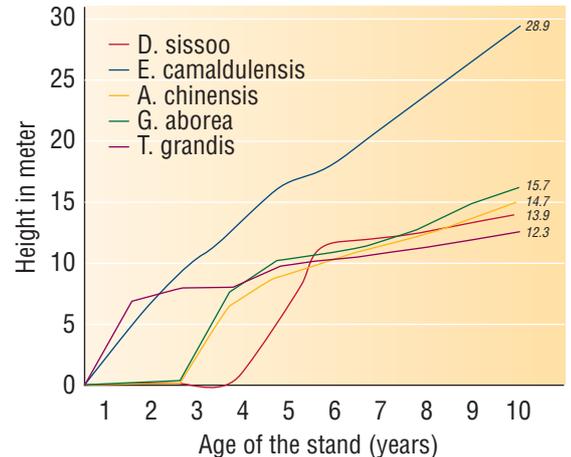


In terms of height growth, four species (*D. sissoo*, *A. chinensis*, *G. arborea* and *T. grandis*) had similar growth reaching 12.3 - 15.7 meters after 10 years (Figure 3). *E. camaldulensis* grew almost twice as fast as the other four species, showing clearly why it is farmers' preferred species for both types of plantation, particularly for pole production.

Timber values and optimal sizes

In the study area, the price of timber or logs is determined according to size by the local saw- and ply- and paper mill operators. Girth is used to fix the market rate per cubic foot of timber. The minimum size for a log is 2 feet in girth and 6 feet in length. With an increase in girth size, per unit value of the timber also increases. The figures below are based on data from 2002 to 2007 according to actual sales recorded by girth size, with prices in 2002 taken as a base level. For *D.*

Figure 3. Height growth curves of 10 year old stand plantations of study species



ITTO fellowships offered

ITTO offers fellowships through the Freezailah Fellowship Fund to promote human resource development and to strengthen professional expertise in member countries in tropical forestry and related disciplines. The goal is to promote the sustainable management of tropical forests, the efficient use and processing of tropical timber, and better economic information about the international trade in tropical timber.

Eligible activities include:

- participation in short-term training courses, training internships, study tours, lecture/demonstration tours and international/regional conferences;
- technical document preparation, publication and dissemination, such as manuals and monographs; and
- post-graduate studies.

Priority areas: eligible activities aim to develop human resources and professional expertise in one or more of the following areas:

- improving transparency of the international tropical timber market;
- promoting tropical timber from sustainably managed sources;
- supporting activities to secure tropical timber resources;
- promoting sustainable management of tropical forest resources;
- promoting increased and further processing of tropical timber from sustainable sources; and
- improving industry's efficiency in the processing and utilization of tropical timber from sustainable sources.

In any of the above, the following are relevant:

- enhancing public relations, awareness and education;
- sharing information, knowledge and technology; and
- research and development.

Selection criteria: Fellowship applications will be assessed against the following selection criteria (in no priority order):

- consistency of the proposed activity with the Program's objective and priority areas;
- qualifications of the applicant to undertake the proposed fellowship activity;
- the potential of the skills and knowledge acquired or advanced under the fellowship activity to lead to wider applications and benefits nationally and internationally; and
- reasonableness of costs in relation to the proposed fellowship activity.

The maximum amount for a fellowship grant is US\$10 000. Only nationals of ITTO member countries are eligible to apply. The next deadline for applications is **2 March 2009** for activities that will begin no sooner than 1 August 2009. Applications will be appraised in June 2009.

Further details and application forms (in English, French or Spanish) are available from Dr. Chisato Aoki, Fellowship Program, ITTO; Fax 81-45-223 1111; fellowship@itto.or.jp (see page 2 for ITTO's postal address) or go to www.itto.or.jp. ITTO fellowships offered

sissoo, the percentage increase in value of the timber slowed gradually with increase in girth while for teak the largest logs attracted the highest percentage price increases (Figure 4 and 5). For *G. arborea*, by far the largest increase in value was seen for a relatively small increase in girth size (Figure 6). Since *A. chinensis* is very recently introduced in the area, the species has not reached yet the production stage and therefore the market price was not available, while *E. camaldulensis* is used for poles and not sold to mills.

Conclusion

Overall, farmers preferred *E. camaldulensis* for both types of plantation. This is mainly due to its fast growing characteristics and quick economic return on investment. Out of twenty farmers interviewed, eighteen were growing this species in bond and stand, plantations with the sole objective of producing poles.

For timber, farmers' initial preference was for *D. sissoo* but this was gradually replaced by *G. arborea* because of a die-back problem with the former. In terms of economic returns, small size timber was generally more profitable (except for teak) because the additional price available for larger timber has not justified the additional time required to grow it over the last six years (2002 to 2007). This information is being disseminated to farmers in the central Terai to help them to optimize returns from their plantations.

Figure 4. Price increases for *D. sissoo* timber by size

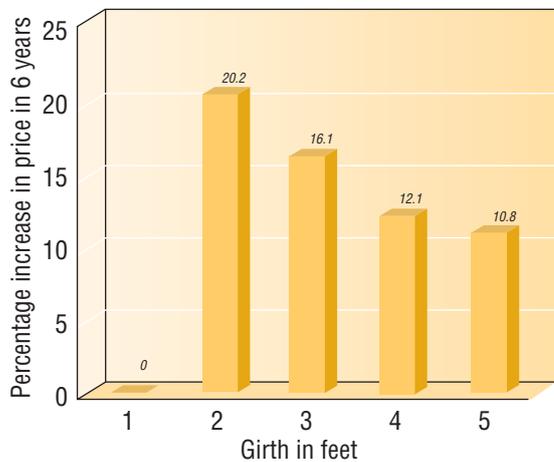


Figure 5. Price increases for teak timber by size

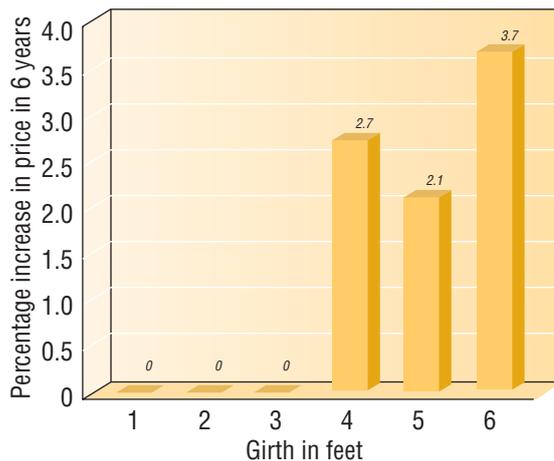
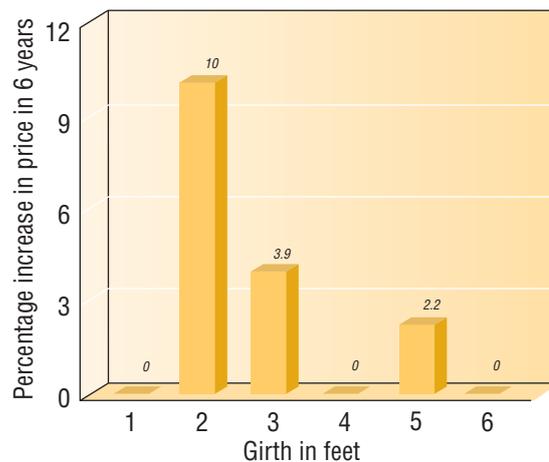


Figure 6. Price increases for *G. arborea* timber by size



The full Fellowship report is available on request from fellowship@itto.or.jp

Fellowships awarded

Twenty-three fellowships worth US\$149 750 were awarded at the 44th Session of the International Tropical Timber Council in November 2008. Awardees were:

Alhassan Marshall Adams (Ghana) to undertake a Masters Program in Environmental Resource Management at Kwame Nkrumah University of Science and Technology in Kumasi, Ghana; **Kossi Adjonou** (Togo) to undertake Ph.D. Research on 'Elaboration of Basis of the Sylviculture in Natural Forests in Togo' at University of Lomé, in Togo; **Djetouan Dieudonne Akian** (Cote d'Ivoire) to attend a short training programme on 'The Strategy for the management of fringe and infiltrated populations: Case study of the Seguel Gazetted Forest' in SIFCI-Vavoua Timber Company, at Vavoua and Seguela in Cote d'Ivoire; **Danielle Camargo C. Augusto** (Brazil) to undertake Masters research on 'Litterfall Dynamics and Nutrient Inputs Under Different Tropical Forest Restoration Strategies' at CATIE in Turrialba, Costa Rica; **Abraham Baffoe** (Ghana) to undertake Masters Research entitled 'Implications of Forest Certification on Forest Management and Timber Export Trade in Ghana' at the Louisiana State University in Baton Rouge, U.S.A.; **Waluyo Eko Cahyono** (Indonesia) to undertake an Environmental Study Masters program at Padjadjaran University in Bandung, Indonesia; **Aurea Erica Castro Aponte** (Peru) to attend the XXI Intensive International Course in Diversified Management and Natural Tropical Forests at CATIE in Turrialba, Costa Rica; **Nishith Arunbhai Dharaiya** (India) to attend a training course in 'Effective Leadership and Communication Tools for Environmental Management and Conservation' at the Smithsonian Institute in Virginia, U.S.A.; **Michael Ishmael Fofana** (Liberia) to participate in an international training course in 'Scaling-up Agroforestry for Livelihood and Sustainable Development' at TREES, University of the Philippines, Los Baños, Philippines; **Paola Gómez García** (Mexico) to undertake a Masters program in Plant Science at McGill University in Montreal, Canada; **El El Swe Hlaing** (Myanmar) to undertake Masters research on 'Factors for Sustained Community Forest User Groups' Participation in Community Based Forest Management: A Case Study in the Dry Zone Area of Myanmar' at the University of Tokyo in Japan; **Jasni Jasni** (Indonesia) to attend the 6th Conference of the Pacific-Rim Termite Research Group in Kyoto, Japan; **Ditter Horacio Mosquera Andrade** (Colombia) to undertake a Masters program in Tropical Agroforestry at CATIE in Turrialba, Costa Rica; **Robert Timango Ngidlo** (Philippines) to participate in an international training course in 'Environmental Management' at Galilee College in Israel; **Chidiebere Ofoegbu** (Nigeria) to undertake a Masters program in Forestry at the University of Stellenbosch in Stellenbosch, South Africa; **Shiv Shanker Panse** (India) to prepare a document on 'Study of Grading Process of Wood Raw Material Used in Different Wood Based Industries in India with Special Emphasis on Wood From Agroforestry'; **Alfredo Portilla** (Peru) to undertake a Masters program in Environmental Socioeconomics at CATIE in Turrialba, Costa Rica; **Mesmin Sebiro** (Central African Rep.) to undertake a Post-graduate program at ENEF in Libreville, Gabon; **Cecilia Goncalves Simoes** (Brazil) to undertake Ph.D. research on 'How to Best Use Reduced Emission from Deforestation and Degradation (REDD) Money in the Brazilian Amazon' at the University of Tsukuba in Japan; **Dol Raj Thanet** (Nepal) to undertake a Masters program in Forestry at Tribhuvan University, Institute of Forestry in Pokhara, Nepal; **Erica Udas** (Nepal) to undertake a Masters program in Landscape Ecology and Nature Conservation at Greifswald University in Germany; **San Win** (Myanmar) to prepare a technical document on 'Investigation of Shifting Cultivation Practices Conducted by Different Hill Tribes in Order to Develop Appropriate Agroforestry Practices in Myanmar'; and **Prudence Yombiyeni** (Gabon) to participate in a study tour on 'Wood Decaying Funguses' for the preparation of Ph.D. research at the Catholic University of Louvain in Louvain, Belgium.