Fellowship report

How well do mangroves planted on ex-agricultural land in Myanmar's Ayeyarwady Delta survive and grow?

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MYANMAR has about 380 000 hectares of mangrove forests distributed in the Rakhine Division, the Taninthayi Division and the Ayeyarwady Delta, with almost 50% in the latter (Pe Thein 1989). Forty years ago, the density of mangrove forests of the Delta was high. However, an increasing human population has led to over-cutting and the encroachment of forestland for agricultural purposes in the Delta. The estimated rate of mangrove deforestation in the Delta for the period 1984–1991 was 7775 hectares per year (Sit Bo 1992). Because of a decline in productivity, some of the cultivated land that replaced the mangrove forest was abandoned after 10–20 years. Most of the mangrove plantations established by the Myanmar Forest Department and local communities were in these abandoned paddy fields.

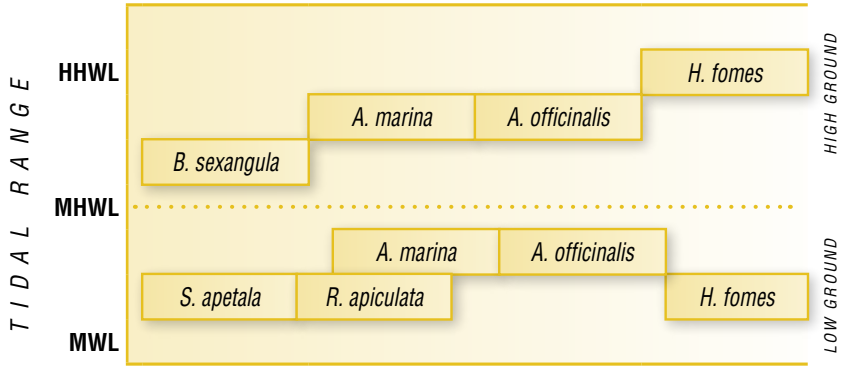
Objective

The aim of this study was to clarify the survival and growth of six native mangrove species (*Avicennia officinalis*, *A. marina*, *Bruguiera sexangula*, *Heritiera fomes*, *Rhizophora apiculata* and *Sonneratia apetala*) that were planted on abandoned paddy fields in the Delta where natural mangroves once existed.

The Delta is located in the southern part of Myanmar between latitudes 15° and 18° north and longitudes 94° and 96° east. The climate of the Delta is characterized by three seasons: a rainy season from the middle of May to October, a winter season from November to February, and a dry season from March to the middle of May. Average rainfall is over 3000 mm annually. Semi-diurnal tides occur in the Delta.

Highs and lows

Figure 1: Locations of sample plots across the tidal levels and species investigated



HHWL = highest high water level; MHWL = mean high water level; MWL = mean water level

Plot establishment

Nine permanent sample plots with a dimension of 18 × 18 m were set up in the reforestation sites. Daily tidal amplitudes were collected during 2004 at Byone Mwe Island in Bogalay Township, Ayeyarwady Delta. Based on tidal amplitudes, tidal levels were classified as highest high water level, mean high water level, mean water level, mean low water level or lowest low water level. Ground levels corresponding to water levels were then defined to identify the levels of sample plots. The salinity of the study area varied in the range 0.2–2.4% over the year, depending on tidal and seasonal conditions. In the rainy season, the salinity of river water was almost zero. Soil pH varied from 4 to 6.4, depending on the site. The soils were mainly silty clay or clay. The locations of sample plots and their ground levels as well as the species investigated are illustrated in *Figure 1*. For each species, 100 individuals were examined monthly to record survival and growth rates and any site disturbances.

Survival and growth

High ground

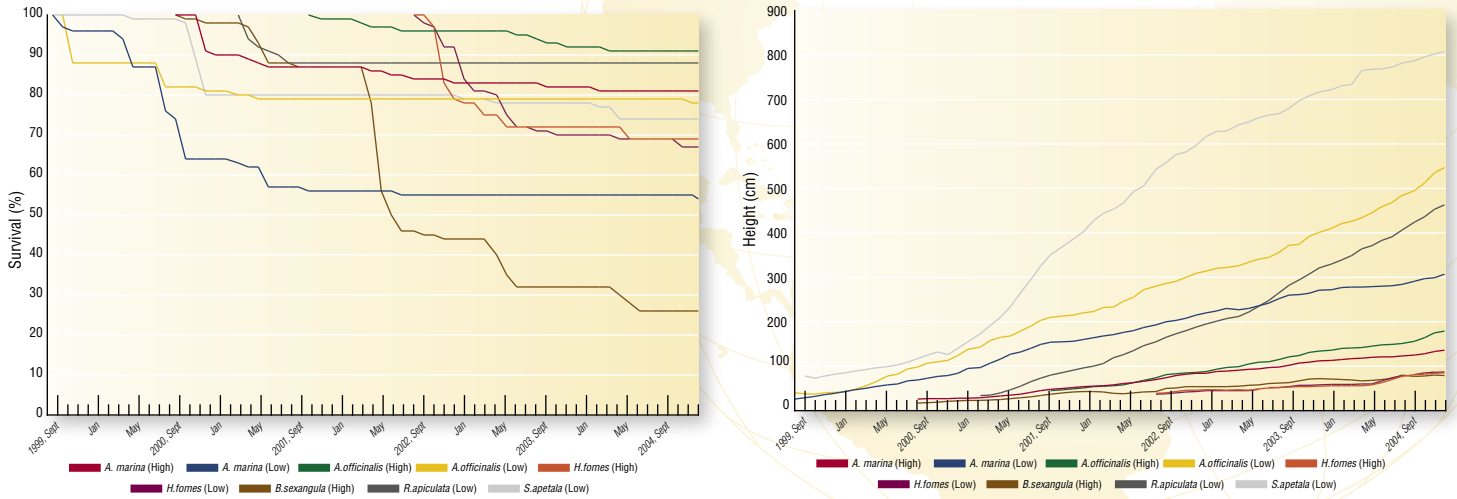
After three years and two months, the survival rate and mean height of *A. officinalis* were 91% and 1.8 m, respectively. After four years and three months the survival rate was 81% for *A. marina* and 26% for *B. sexangula*. Their mean heights were 1.4 m and 0.8 m, respectively. The survival rate for *H. fomes* was 69% after two years and four months and its mean height was 0.9 m *(Figure 2)*.

Low ground

The survival rate and mean height of *R. apiculata* were 88% and 4.6 m after three years and nine months. The survival rates of *A. officinalis*, *S. apetala* and *A. marina* were 78%, 74% and 54%, respectively, after five years and three months; mean heights were 5.5 m, 8.1 m and 3.1 m. After two years

Mangrove performance

Figure 2: Survival *(left)* and height growth *(right)* of mangrove species planted on high and low ground in the Ayeyarwady Delta



and four months, the survival rate of *H. fomes* was 67% and its mean height was 0.9 m.

Disturbances

Caterpillars, crabs, rodents and stem borers were the major biotic disturbances in the plantations. On the other hand, desiccation was the most important abiotic disturbance, especially for plantings on high ground.

Conclusion

The findings indicate that low survival rates and poor growth can be attributed to both ground-level and biotic disturbances. Tree growth was significantly better on low ground than on high ground. On low ground, *S. apetala* demonstrated the best growth and *R. apiculata* had the highest survival rate. On high ground, the survival and growth rates of *A. officinalis* were highest among the species assessed.

References

Pe Thein 1989. *Note on mangrove forests of Myanmar*. Myanmar Forest Department, Yangon, Myanmar.

Sit Bo 1992. *Report on assessment of change of mangrove forests in Ayeyarwady Delta Using Remote Sensing Data*. Myanmar Forest Department, Yangon, Myanmar.

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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.

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- participation in short-term training courses, training internships, study tours, lecture/demonstration tours and international/regional conferences;
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Priority areas: eligible activities aim to develop human resources and professional expertise in one or more of the following areas:

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- 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
- reasonable ness of costs in relation to the proposed fellowship activity.

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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