

# Mainstreaming Mangroves

Proceedings of Regional Symposium on Mangrove Ecosystem Management  
in Southeast Asia,  
Feb. 27 – Mar. 1, 2013,  
Surabaya, Indonesia

Edited by:  
Bedjo Santoso  
Takahisa Kusano



Ministry of Forestry, Republic of Indonesia

# **Mainstreaming Mangroves: Proceedings of Regional Symposium on Mangrove Ecosystem Management in Southeast Asia**

Edited by: Bedjo Santoso and Takahisa Kusano

ISBN: 978-979-606-097-9

**Citation:** Santoso, B. and Kusano, T. (eds.), 2013, *Mainstreaming Mangroves*, Indonesian Ministry of Forestry, Jakarta

© Indonesian Ministry of Forestry and JICA, 2013

This symposium was conducted as one of activities of the technical cooperation project between Ministry of Forestry, Indonesia and Japan International Cooperation Agency (JICA) for Mangrove Ecosystem Conservation and Sustainable Use in the ASEAN Region (MECS Project)

No reproduction of any part of this publication may take place without the written permission of the Indonesian Ministry of Forestry and JICA.

**Disclaimer:** The perspectives and knowledge described in individual messages and papers contained in this publication represent only the author/s, and do not reflect the views of the editors, the organizer nor the publisher.

**Published by: Ministry of Forestry, Republic of Indonesia**  
Mangala Wana Bakti Building, Jl. Gatot Subroto, Jakarta, Indonesia

Book Design and Compilation by: Rika Novida

A copy may be obtained by writing to the National Coordinator of MECS Project (secretariat@mecs.org/novidarika@gmail.com). Post and handling fee will be charged. Or you can download from <<https://www.mangrove-mecs.org> >



## Estimation of CO<sub>2</sub> fixation capacity and growth potential on mangrove forest in South East Asia

Okimoto Y<sup>1,2\*</sup>, A Nose<sup>1</sup>, R.A. Suwignyo<sup>3</sup>, TZ Ulqodry<sup>1</sup>, Y Oba<sup>1</sup> and Y Tateda<sup>4</sup>

<sup>1</sup> Saga University, Saga, Japan. <sup>2</sup>Center for International Forestry Research, Bogor, Indonesia. <sup>3</sup> Sriwijaya University, Palembang, Indonesia, <sup>4</sup> Central Research Institute of Electric Power Industry, Chiba, Japan

### Abstract

Carbon pools of mangrove forests are among the highest of tropical forest types (Bouillon et al., 2008). Of great interest is the mangroves' potential value in carbon mitigation programs, such as REDD+ and other financial incentives tied to conservation of standing forests (Kauffman and Donato, 2012). Carbon stocks of mangrove forest have been estimated with allometric equations. Although some of them are approved in UNFCCC for AR-CDM as default ones for estimating above-ground biomass (e.g. Putz and Chan, 1986; Clough and Scott, 1989; Chave et al. 2005), the allometric method is laborious and time consuming (Clough, 1997). We have challenged to develop alternative methodologies and proposed both analysis methods of gas exchange and growth curve (Okimoto et al., 2007, 2008). The former derives CO<sub>2</sub> balance of photosynthetic absorption and respiratory emission of CO<sub>2</sub>. They are based on measurements of photosynthesis in leaf and respiration in each organ such as leaf, branch, trunk and root. Accuracy in the estimation has been acquired by involving models of daily and monthly variation in both light intensity and temperature for the above-ground CO<sub>2</sub> balance and corrections of root respiration in response to low oxygen concentrations. Meanwhile, the latter gives stand biomass variations over the time. The growth curve is determined with three elements; a few of different-aged stand biomass, a coefficient of the growth curve and an assumed maximum stand biomass. According to our results in South-East Asia, above-ground biomass increment of the gas exchange estimations were 66.0 ton ha<sup>-1</sup> yr<sup>-1</sup> for 7 year-old *Kandelia candel* forest in Nam Dinh, Vietnam (21° North latitude), 34.3 ton ha<sup>-1</sup> yr<sup>-1</sup> for 10 year-old *K. candel* forest in Thanh Hoa, Vietnam (19° N) and 76.3 ton ha<sup>-1</sup> yr<sup>-1</sup> for 9 year-old *Rhizophora apiculata* forest in Trat, Thailand (12° N), respectively (Fig.1.). Based on the results and our field observation that those forests are already matured even at their 15 year-old, maximum growth potential of the *K. candel* forests in Nam Dinh and Thanh Hoa is estimated as 265 and 305 ton/ha, respectively. Consequently, it is expected that the mangrove monoculture forests in around 20° N (the North Vietnam) have a growth potential up to around 300 ton/ha. In a similar way, some data for 8-10 year-old *R. apiculata* forest in Sungai Asam, Indonesia (2° S) is under analysis. They will be combined with the data for *R. apiculata* in Trat mentioned above to figure out the growth potential in the equatorial areas.