

## **THE INTERFACE BETWEEN FOREST SCIENCE AND POLICY — A REVIEW OF THE IUFRO INTERNATIONAL AND MULTIDISCIPLINARY SCIENTIFIC CONFERENCE 4–7 OCTOBER 2016: FORESTRY-RELATED POLICY AND GOVERNANCE: ANALYSES IN THE ENVIRONMENTAL SOCIAL SCIENCES**

*Stephen Elliott<sup>1</sup>*

### ABSTRACT

This commentary uses the experience of attending the “Multidisciplinary Scientific Conference on Forestry-related Policy and Governance” to contrast the lack of progress with socio-political-economic aspects of forest conservation/restoration with the technical advancements that have been achieved over recent decades. The social problems raised during this conference were almost identical to those addressed by similar conferences 20–30 years ago, including poor governance, ineffective funding mechanisms, failure to engage local communities and poor communication between scientists and policy makers. Recent developments, such as REDD+, were dismissed as largely ineffective, with no consensus on effective solutions. In contrast, over the same time frame, forest ecologists have succeeded in developing effective techniques that have largely overcome the technical barriers to restoring forest ecosystems that existed 30 years ago, such as accelerated natural regeneration, the framework species method, applied nucleation etc. A global study is called for on the extent to which existing science-policy interface mechanisms succeed or fail to increase forest cover and related products and services to stakeholders, so that existing socio-political barriers to forest conservation/restoration can be removed, as the technical barriers have been.

Keywords: forest science-policy interface, REDD+, plantation, forestry institution

Whilst forest scientists have overcome many of the practical obstacles to forest conservation and restoration, over the past 30 years or so, it seems that socio-economic-political scientists have yet to make substantial progress with resolving the human issues that continue to impede effective sustainable forest management on scales large enough to have a significant global impact on climate change, biodiversity loss and rural poverty. Such issues include poor governance, lack of effective funding mechanisms, failure to engage local people and, in particular, failure to base forest policies and management practices on sound science.

This was the disappointing message I took home from International and Multidisciplinary Scientific Conference of International Union of Forest Research Organizations (IUFRO), hosted by Bogor Agricultural University (Indonesia) and the University of Goettingen (Germany), 4–7<sup>th</sup> October 2016. The 4-day gathering attracted more than 400 participants, from 28 countries. Billed as a “*platform for science-based contributions towards interfacing scientific knowledge into policy and management practices*”, the meeting comprised keynote

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<sup>1</sup> Forest Restoration Research Unit, Department of Biology, Faculty of Science, Chiang Mai University, Thailand. E-mail: [stephen\\_elliott1@yahoo.com](mailto:stephen_elliott1@yahoo.com)  
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presentations, plenary panels and parallel technical sessions on governance, economic and environmental policy, co-management, multi-stakeholder collaboration, and land use assessment and certification—as they relate to forestry.

Here, I present summaries of the plenary sessions plus a selection of papers on recurrent topics that emerged from the technical papers. However, since the technical papers were presented during seven parallel sessions, I had to be selective. For the full view, the abstract book is accessible via the IUFRO website<sup>2</sup>.

In the opening keynote, Max Krott (University of Goettingen) talked about the disconnect between scientific research and political decision-making. Scientists continually update their findings and usually have a long time to carry out their research, whereas policy-makers and managers must commit to immediate decisions, with long-term consequences. Such decisions cannot be changed every time scientists achieve new breakthroughs. Merging science with political action (“*blurring the boundaries*”) does not work. Practitioners have little understanding of scientific methods, whilst scientists are poor at compromising on scientific truths and dealing with conflicts. Krott called for the hiring of “*professional integrators*” (particularly economists) to bridge the gap and facilitate bidirectional selection of research questions and results. Better communication helps, but it is not sufficient alone to build the bridge. Scientists must be orientated towards meeting public goals (the main one being to balance the economic, ecological and social goals of sustainable forestry) and integrators should help policy makers reconcile scientific knowledge with socio-economic considerations. Integrators should also decide on the relevance of actions and research questions, since (according to Krott) scientists lack the capacity to consider factors outside of their fields of specialization. “*We need excellent national science, professional integration and responsible political decision-making*”.

In the first plenary panel session, Henry Bastaman (DG of the Research, Development and Innovation Agency of Indonesia’s Ministry of the Environment and Forestry) said that his agency is “*adapting to the dynamic demands of a changing society*” by encouraging inputs from civil society and by better articulating scientific knowledge to government policy-makers. He re-iterated Krott’s point that science takes time, whereas policy-makers must make immediate decisions.

Lukas Giessen (University of Goettingen) highlighted how forest management is affected by the “*fragmentation*” of forest policy-making (meaning division of the vast range of policies that affect forestry, from human rights, to international relations and trade) among a multitude of institutions. At the global level, he identified 41 policies that impact the forestry sector. He bemoaned the “*hollowing-out*” of the UN Forum on Forests<sup>3</sup>—especially its low core-budget from the UN and its consequent reliance on country-contributions for funds. This leaves one of the most important global forest policy institutions susceptible to undue influence from the major funding countries. At the regional level, ASEAN<sup>4</sup> seems to be the most relevant regional regime, blocking unwanted international interference in forest policy-making, attracting international political support and funding, imposing certification schemes and strengthening the negotiating positions of its member states (e.g. with industrialized countries, during

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<sup>2</sup> [https://www.iufro.org/download/file/26300/6199/90500-bogor16-abstracts\\_pdf/](https://www.iufro.org/download/file/26300/6199/90500-bogor16-abstracts_pdf/)

<sup>3</sup> A UN subsidiary body to promote “... the management, conservation and sustainable development of all types of forests and to strengthen long-term political commitment to this end”.

<sup>4</sup> Association of South-East Asian Nations

climate-change talks). However, a lot of *de facto* forest policy-making occurs through bilateral agreements with countries or corporations. Giessen quoted the example of German funding of forest management units in Indonesia, to mitigate climate change—a scheme which is also enabling the Indonesian government to recentralize its control over forest governance, at the expense of the provinces. Giessen concluded that the momentum of forest policy initiatives increases from global to regional and bilateral levels. The latter promise the most immediate impacts, but come with the potential downside of foreign donors exerting leverage over management of the sovereign forest resources of recipient countries. “*International forest policy is not a solid thing; it is a menu for actors to choose from.*”

In contrast to Giessen, Bas Arts (University of Wageningen) thought that “*fragmentation*” of forest policy-making was a “*non-issue*”. He looked at the translation of global forest policies into local forest management practices and suggested that a global convention, similar to that for biodiversity<sup>5</sup>, is needed to standardize concepts and provide adequate resources to connect global agreements to local practices. His global review of participatory forest management projects (PFM), which cover millions of hectares, revealed mixed results. Although PFM undoubtedly improves forest quality, the delivery of livelihood benefits has been equivocal and it has largely failed to empower local people. “*The forests have benefited more than the people.*”

Dodik Nurrochmat (Bogor Agricultural University) outlined a model for green low-carbon development that generates revenue through carbon-based PES<sup>6</sup>. He stated that the main problem with forest values is that they are intangible (i.e. they do not generate cash income). “*We need to give higher tangible values to forest.*” PES converts intangible values into cash, but the main problems are firstly how to persuade users of forest services to pay for what they previously regarded as “free”, and secondly, how to distribute the income among many diverse stakeholders. Furthermore, the “purchasers” of forest services want to know if they are getting their money’s worth—and that means regulation and certification, which adds considerably to the costs of PES schemes. This raises another important issue: who should be the certifiers? The government? Or private sector agencies? In Indonesia, the legal ramifications have yet to be resolved.

## REDUCING EMISSIONS

One of the few advancements claimed by socio-economic scientists over recent decades is REDD+, Reducing Emissions from Deforestation and Forest Degradation—policies and incentives, developed under the UN Framework Convention on Climate Change, to finance forest conservation and restoration, by placing a value on the capacity for forests to absorb atmospheric carbon dioxide and thus mitigate global climate change.

However, papers on REDD+ at the conference were far from encouraging. A view expressed in several was that this prominent global initiative subverts local forest management practices to meet global demands, at the expense of satisfying local needs. Runsheng Yin

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<sup>5</sup> The Convention on Biological Diversity (CBD) for conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising therefrom. Entered into force on 29 December 1993.

<sup>6</sup> Payments for ecological services—whereby those who generate an ecological service (often through forest conservation or restoration) are paid by those who use it, e.g. water users paying for watershed conservation.

(Michigan State University) discussed whether REDD+ undermines the popular goal of decentralization of forest management, by impinging on the traditional rights of local communities, whilst failing to deliver appropriate payments to villagers. He suggested that increasing local engagement, by strengthening local tenure of forest resources, is key to the success of REDD+. “*We must pay more attention to reforming forest tenure and governance to deliver results-based payments that are both consistent and coherent*”.

Yeon-su Kim (Northern Arizona University) re-iterated the point that focusing too much on forest carbon storage does not necessarily meet local needs—specifically water supply. In her study site on Lombok, deforestation peaked just before 2000, due to uncertain land tenure, which resulted in the villagers adopting the attitude that “*if we don’t cut now, someone else will cut it.*” However, a Korean-funded REDD+ project brought about better forest protection, such that, from 2000 to 2015, the forest started to regenerate and the remaining area of primary forest stabilized. Community partnerships aimed to restore forest to 1995 levels, provided the villagers could use parts of the reforested sites, to some degree. However, this concept is threatened by the perception that transpiration through the restored forest canopy decreases water yields and concentrates pollutants downstream. The villagers are conflicted: “*they want to plant trees, but they also want more water. Simply increasing tree cover is not enough. Mixed agroforestry can be a key strategy.*” She suggested replacing fast-growing tree plantations with more diverse tree species that have low transpiration rates and deep roots, promoting agricultural practices that increase infiltration, establishing sediment filter strips and protecting riverbanks and springs.

Also working on Lombok, Moh. Tusram Massijaya (Bogor Agricultural University) reported that illegal logging and encroachment of forestlands are the main drivers of deforestation. The REDD+ project (mentioned above) granted local communities rights to manage parcels of forestland in and around Gunung Rinjani National Park. It also built capacity within the communities and empowered them to manage forests appropriately, e.g. through sustainable harvesting of non-timber forest products, crop cultivation beneath the forest canopy and rehabilitation of degraded forest lands.

Ram Pandit (University of Western Australia) showed that, in Nepalese community forests, the factors that determined REDD+ adoption varied between the two watersheds that he studied. Since 1987, community forestry, has definitely brought the forests back, but like many other speakers, Pandit thought that we may now be incentivizing villagers to satisfy global needs (e.g. carbon storage) at the expense of meeting local needs (e.g. firewood). He found that nearly all villagers were willing to adopt REDD+, but less than half of them actually understood its goals. The most important determinants of REDD+ adoption were: respondent’s age, household economic status and proportion of firewood supplied from private land. However, results were inconsistent between the two watersheds. Therefore, the design of REDD+ projects must take into account the contexts of both households and watersheds—“*context matters*”.

Iis Alviya (Indonesian Ministry of Environment and Forestry), agreed. In her study of community-based forest management, to reduce CO<sub>2</sub> emissions, at nine communities in Papua, Central Kalimantan and Riau, she found that most communities would like to convert forest into oil palm plantations, but customary laws<sup>7</sup> and limited access/rights to the forest

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<sup>7</sup> Unofficial regulations, based on long-established social or cultural norms, accepted as lawful. Rights enjoyed through long custom rather than written laws.

have prevented them from doing so. The emergence of better forest management practices (alternatives to oil palm) is also hindered by restricted access to natural resources, as well as land conflicts and lack of supporting organizations, knowledge and funding. The importance of each factor varied among the three provinces studied—so again context matters.

The ultimate test of REDD+, however, is to detect a decline in forestry-related CO<sub>2</sub> emissions. Maria Brockhaus (CIFOR<sup>8</sup>) reported that so far (2001–2014), REDD + has failed to reduce forestry-related CO<sub>2</sub> emissions in 13 out of the 14 countries that she studied. Only Brazil has achieved a slight reduction, whilst remaining by far the highest forest-CO<sub>2</sub>-emitter in the study. It is a “*chicken-and-egg scenario*”: REDD + needs change to work, but it is also supposed to induce change. The transformational changes needed are being hindered by powerful “*business-as-usual actors*”. Governments must regulate the behavior of large-scale investors, but “*only an empowered civil society can actually hold businesses and states accountable. From rhetoric to actually reducing emissions seems to be a very long way. I hear a lot, but I don’t see much.*”

## PLANTATIONS

A rare forest policy success story came from Australia. In a detailed economic analysis, Russell Warman (University of Tasmania) showed that forest conservation there did not result in “leakage” (i.e. reduced logging in conserved forests causing increased logging elsewhere); neither did it stimulate log imports. This was because, although plantations covered a relatively small land area, they met >80% of the country’s timber demand. Policies that increased protected forests, whilst also supporting plantation establishment, were clearly having positive conservation outcomes. He concluded that “*there remains capacity to conserve even more forest in Australia without leakage*”.

Romain Pirard (CIFOR) reported that global timber production from natural forests peaked in 1989 and has been declining ever since, with timber plantations becoming ever more important. He tested the hypothesis that plantations support natural forest conservation, assuming that: natural forest logging causes degradation; plantations are not established on forest areas; plantations are designed to produce a wide range of products and they are used in priority over natural forests. His literature review confirmed that globally, plantations are taking over, but it was difficult to prove that this was at the expense of natural forest. In the absence of logging, revenue from forests falls and their conversion to agriculture becomes more likely. “*Relying on plantations is not sufficient to conserve natural forest. Policies and law enforcement are also important.*”

## FIRE

Forest fires received surprisingly scant attention, considering the location of the meeting. Herry Purnomo (Faculty of Forestry, Bogor Agricultural University) showed that in Indonesia, most fires occur in corporate-managed wood plantations and frequently to clear land for

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<sup>8</sup> Centre for International Forest Research

expansion of oil palm plantations. He found that the average market value of land increases from US\$ 665/ha before burning to US\$ 856/ha afterwards, with a complex network of farmer groups, village heads, land claimants and even marketing teams receiving payments. Corporations rely on building connections with “*elites*”, at both the national and international levels, to facilitate land acquisition. Once converted to oil palm, the land price skyrockets to US\$ 3,077/ha (at 3 years). So, burning pays massive dividends that are widely dispersed among complex networks of players.

In her analysis of media coverage of the forest fires in Indonesia and the resultant spread of haze across international borders, Laura Porter-Jacobs (University of Melbourne) found that people in the different affected countries came to different conclusions about who was responsible for the problem and its solution. For example, the Singaporean media blamed plantation owners, whereas the Indonesian media often did not assign blame. She concluded that ASEAN was the most appropriate regional body to reconcile the different views, held by affected countries.

## INSTITUTIONS

During the final plenary session, I was expecting a synthesis of the papers presented and perhaps some emergent conclusions as to how to work towards improving the forest science-policy interface. But instead, a panel of speakers used the time mostly to promote the work of their respective institutions.

Iskandar Z. Siregar from IPB (Bogor Agricultural University) stressed the importance of working within a research consortium, co-ordinated via a knowledge-management system, to promote national and international collaboration on a wide range of issues. The system synthesizes incoming ecological and socio-economic data and information from many sources (from Ph.D. student theses to satellite data) into “*knowledge products*” for government ministries and the business sector, or converts them into user-friendly learning materials for local communities (e.g. cartoon books). Pro-active marketing of the knowledge products is essential, to secure the funding that ensures project sustainability. “*Sound management of large collaborative research platforms is key to ensure sustainability and effective stakeholder engagement.*”

In addition to its advanced data systems, the University’s Forestry Faculty also maintains a remarkable 359-ha educational forest at Gunung Walat, Sukabhumi District (West Java), where 95% forest cover has been returned to a denuded site formerly dominated by *Imperata* grass. Trees, planted by both students and local communities since 1961, now comprise forest habitat for monkeys and bears. The forest station has accommodation for 500 students and researchers, as well as a conference centre with ample facilities to host training workshops and symposia for ministry officers, university students and international organizations ([www.gunungwalat.net/](http://www.gunungwalat.net/)).

Bambang Suprianto (Ministry of the Environment and Forestry) stressed the need to bridge gaps between national forestry laws and customary laws. Some laws fail to recognize the existence of people in forests, whereas others legitimize customary laws. More than 2,000 villages exist in and around Gunung Halimun Salak National Park. With incomes far below the national average, the villagers need access to economic forest resources. However, the park protects the largest remaining population of the critically endangered Javan Gibbon (one of

the world's most threatened primates) and its watersheds supply water to three provinces—yet deforestation continues at about 1%/year. When the park was declared, indigenous areas were not demarcated, even though the constitutional court recognizes indigenous peoples' forest lands. So how can the constitutional rights of the villagers be recognized and income generated, whilst maintaining forest conservation? Suprianto suggested that we need to develop “*a common vision, co-regulation (community-based park management) and co-zoning, leading to integrated spatial management.*”

Terry Sunderland, Principal Scientist with CIFOR's Forests and Livelihoods programme, outlined how his organization was “*stepping up to the new global development agenda.*” The centre works in 33 countries, to fill gaps between policies and practices. With the world's human population predicted to climb to 9.6 billion by 2050, CIFOR's future work will be guided by the UN's Sustainable Development Goals<sup>9</sup> and the Paris Agreement on climate change, based on the three pillars of: research for impact, capacity development and outreach/engagement. He stressed the importance of “*breaking the silo approach of focusing on protected areas, as well as integrating forestry and conservation into the wider landscape,*” but admitted that many challenges remain to “*operationalising the landscape approach*”—moving from theory to practice. He stressed the need to configure landscapes to maximize the benefits that may flow from forests to agriculture. Proximity to forest may increase crop yields, but the evidence is largely anecdotal and should be tested by more rigorous field research.

#### ACTUAL SCIENCE VS. SOCIAL SCIENCE: NOTHING CHANGES?

As an ecological scientist, attending the conference primarily to discover how to integrate the research my unit undertakes with policy decision-making, I was profoundly disappointed. Very few success stories were presented. There were plenty of ideas on ways to proceed, but no consensus on which ones might work. Above all, the core theme of the conference—the science-policy interface—remained largely unaddressed. Apart from the opening keynote, most presenters simply ignored it. But the biggest shock, for me, came at the end of the final session, when one of the organizers, put up a slide of “take home messages.”

The points displayed seemed very familiar, so I opened my laptop and dug through my archives, to notes that I had taken at the conclusion of the very first socially-orientated forestry conference I had attended at RECOFTC<sup>10</sup>, way back in 1994. The main points matched almost exactly!

- i) Develop more effective and transparent forest **governance**.
- ii) Develop better ways to involve local **communities**—more inclusive public engagement.
- iii) **Integrate** forestry with other land uses at the landscape level.
- iv) Develop more innovative **funding** mechanisms (i.e. the perennial plea for more financial support for *long-term* research).
- v) Improve the **science-policy interface**.

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<sup>9</sup> A universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity, which emerged from the UN Conference on Sustainable Development in Rio de Janeiro, 2012.

<sup>10</sup> Regional Community Forestry Training Centre

Little seems to have changed. After almost four days of deliberations, I was expecting a little more than the rewording of decades-old aphorisms. It seems that, over the past three decades or so, socio-economic-political scientists have made little progress with the very issues that they themselves are paid to study and resolve. They seem content to regurgitate *ad nauseam* the same old problems, whilst offering little towards their solution.

In contrast, on the scientific and technical side, ecologists have made great strides in developing effective, practical, forest-restoration techniques over the same period. During the 1980–1990s, a commonly quoted problem with restoring tropical forests was: lack of technical knowledge about the ecology and propagation of the large numbers of tree species that comprise such ecosystems (ELLIOTT *ET AL.*, 1995). However, painstaking research over the last 30 years, by several groups around the world, has resulted in greatly improved practical methods of site assessment and planning, tree species selection, seed collection and genetic conservation, tree propagation, tree planting and direct seeding, as well as maintenance of planted trees (effective weeding and fertilizer application regimes etc.) and monitoring forest recovery, from canopy closure to carbon storage and the return of wildlife (MANSOURIAN *ET AL.*, 2005; LAMB, 2011; ELLIOTT *ET AL.*, 2013; GOOSEM & TUCKER, 2013; BOZZANO *ET AL.*, 2014).

Such research has enabled ecologists to devise reliable procedures, to restore diverse forest ecosystems to forestland at all stages of degradation (LAMB, 2011) from simple protective measures (CHAZDON, 2014) and assisted (or accelerated) natural regeneration, on moderately degraded sites (SHONO *ET AL.*, 2007), to the framework species method and maximum diversity methods of GOOSEM & TUCKER (2013), where natural regeneration is lacking; and nurse-tree plantations, to improve the soil on the most severely degraded sites (SIDDIQUE *ET AL.*, 2008). The design, size and placement of restoration plots have also received considerable attention, from corridors, to facilitate the dispersal of wildlife and the seeds they carry (TUCKER & SIMMONS, 2009) to “applied nucleation” (i.e. planting small forest patches to catalyse more widespread forest recovery (ZAHAWI *ET AL.*, 2013). Such techniques have been adapted to many different circumstances, from providing local communities with foods and materials (e.g. rainforestation farming [SCHULTE, 2002]) to rehabilitating open-cast mines (PARROTTA *ET AL.*, 1997). Such effective, science-based approaches have contributed greatly to the practicability of “forest landscape restoration” (FLR)—how to integrate forest restoration sites amidst other land uses, to maximize overall ecological and economic benefits (REITBERGEN-MCCRAKEN *ET AL.*, 2007).

So, lack of technical know-how no longer impedes effective restoration and conservation of the world’s tropical forests. It seems that only “human” problems remain, particularly getting the policy makers to adopt and incorporate some of the sound, science-based techniques described above into forest policies and management practices—the science-policy interface. I was, therefore, very disappointed that the conference did not come to any conclusions on this core issue, which was, after all, the stated goal of the event. Socio-economic-political scientists seem content to explain, in ever greater detail, why the tried and tested “technical solutions” that emerge from the experimental plots of ecologists cannot be implemented, due to socio-economic barriers, without actually developing effective tools, with which to overcome them. Small-group discussion sessions (had they been included in the program) might have enabled participants to synthesize the work presented into a prioritized research agenda, to help researchers focus their efforts on developing the most appropriate and effective ways to improve the “*interface between scientific knowledge and policy and management practices.*” I had hoped that the so-called “scientific networking” session, on the final morning, would provide such an opportunity, but it turned out to be a speech from the conference organizers,



encouraging participants to collaborate on joint projects and publish their work in some pre-selected journals—worthy objectives, but a speech is not networking.

So, what might a similar conference deliver in, perhaps, five years from now? What I would like to see are the conclusions of a collaborative international study on the extent to which existing science-policy interfaces succeed or fail to measurably increase forest cover and quality, carbon storage, biodiversity and the provision of forest products and services to stakeholders. Such a study would have to identify the most effective current socio-economic-political mechanisms that i) balance national and local interests and ii) reduce the disparity of power among corporate, governmental and local stakeholders. It would establish a solid foundation of general principles, which could subsequently be refined and adapted to local conditions, to meet local needs. It also might help to answer the perennial question: “How do we scale up from pilot projects to landscapes in a highly variable world?”, and it would go a long way towards dealing with several of the above-listed take-home bullet points.

The most powerful contribution that socio-political-economic scientists could make, towards saving Earth’s tropical forest ecosystems, is to ensure that scientifically proven methods of forest conservation and restoration deliver economic and social benefits that are shared equitably amongst stakeholders. I look forward to walking away from the next conference with an entirely new and original set of conclusions to ponder on the way home.

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## REFERENCES

- BOZZANO, M., R. JALONEN, E. THOMAS, D. BOSHIER, L. GALLO, S. CAVERS, S. BORDÁCS, P. SMITH, AND J. LOO (eds.). 2014. *Genetic Considerations in Ecosystem Restoration Using Native Tree Species. State of the World's Forest Genetic Resources—Thematic Study*. Rome, FAO and Bioversity International. x+281 pp.
- CHAZDON, R. L. 2014. *Second Growth: The Promise of Tropical Rain Forest Regeneration in the Age of Deforestation*. University of Chicago Press, Chicago. 472 pp.
- ELLIOTT, S., V. ANUSARNSUNTHORN, N. GARWOOD, AND D. BLAKESLEY. 1995. Research needs for restoring the forests of Thailand. *Nat. Hist. Bull. Siam Soc.* 43(2): 179–184.
- ELLIOTT, S., D. BLAKESLEY, AND K. HARDWICK. 2013. *Restoring Tropical Forests: a Practical Guide*. Royal Botanic Gardens, Kew. 344 pp.
- GOOSEM, S., AND N. I. J. TUCKER. 2013. *Repairing the Rainforest*, 2nd Edition. Wet Tropics Management Authority and Biotropica Australia, Cairns. 158 pp.
- LAMB, D. 2011. *Regreening the Bare Hills: Tropical Forest Restoration in the Asia-Pacific Region*. World Forests, Vol. 8. Springer, Dordrecht. xxi+547 pp.
- MANSOURIAN, S., D. VALLAURI, AND N. DUDLEY (eds.) (in cooperation with WWF International). 2005. *Forest Restoration in Landscapes: Beyond Planting Trees*, Springer, New York. xxviii+437 pp.
- PARROTTA, J. A., O. H. KNOWLES, AND J. N. WUNDERLE. 1997. Development of floristic diversity in 10-year old restoration forests on a bauxite mine in Amazonia. *For. Ecol. Manage.* 99: 21–42.
- REITBERGEN-McCRACKEN, J., S. MAGINNIS, AND A. SARRE. 2007. *The Forest Landscape Restoration Handbook*. Earthscan, London. 175 pp.
- SCHULTE, A. 2002. *Rainforestation Farming: Option for rural development and biodiversity conservation in the humid tropics of Southeast Asia*. Shaker Verlag, Aachen. 312 pp.

- SHONO, K., E. A. CADAWENG, AND P. B. DURST. 2007. Application of assisted natural regeneration to restore degraded tropical forestlands. *Restor. Ecol.* 15(4): 620–626.
- SIDDIQUE, I, V. L. ENGEL, J. A. PARROTTA, D. LAMB, G. B. NARDOTO, J. P. H. B. OMETTO, L. A. MARTINELLI, AND S. SCHMIDT. 2008. Dominance of legume trees alters nutrient relations in mixed species forest restoration plantings within seven years. *Biogeochemistry* 88: 89–101.
- TUCKER, N. I. J., AND T. SIMMONS. 2009. Restoring a rainforest habitat linkage in north Queensland: Donaghy's Corridor. *Ecol. Manag. Restor.* 10(2): 98–112.
- ZAHAWI, R. A., K. D. HOLL, R. J. COLE, AND J. L. REID. 2013. Testing applied nucleation as a strategy to facilitate tropical forest recovery. *J. Appl. Ecol.* 50: 88–96.