

Restoration ecology of abandoned mono-specific rubber and *Acacia mangium* plantations in tropical rainforests of Selangor, Negeri Sembilan, Federal Territory - Kuala Lumpur, and Sarawak, Malaysia

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PHASE 1

Research activities focused on the restoration ecology of mono-specific rubber plantations in tropical rainforests of Selangor, Negeri Sembilan, and Federal Territory - Kuala Lumpur, Malaysia. The results of these studies have been reported in the First Report. One output of this research is manpower training with Ms Nurfilza Nasir registered under our supervision for an MSc programme in the University of Malaya. She is now in the final stage of her preparation of the thesis, due to be submitted by February - March 2012. She is also in the final stage of preparing and submitting a joint paper for the Journal of Tropical Ecology.

PHASE 2

The initial studies on the restoration ecology of abandoned mono-specific *Acacia mangium* plantations conducted in tropical rainforests of Selangor was abandoned following the reclamation of the study sites for replanting of rubber trees by the relevant government agencies.

We shifted the study sites to include ex-plantations of *A. mangium* in Sampadi-Lundu

Forest Reserves, Sarawak. Extensive field census on species shifts and succession were conducted with the help of botanists and field assistants from the Sarawak Forest Research Centre, Kuching with plots set up in the pristine tropical rain forests nearby as the control. Initial look at the collated data collected indicated some “missing links” among tree species continuum in terms of similarity of species entity and composition between Stage 3 (~ 40 years after abandonment/harvest) of the *A. mangium* forests and the climax tropical forest (arbitrarily named as Stage 4). This warrants a further look for the study sites elsewhere in Sarawak, perhaps in Sabal Forest Reserves, Sri Aman or Suai-Lambir Forest Reserves, Bintulu where *A. mangium* plantations were once established and the remnants of those forests (~ 50 years after abandonment/harvest) still prevailed.

We would like to establish more study plots in those aforementioned forests with the hope/aim of establishing a reasonable continuum of species succession from Stage 1 (15 ~ 20 years after abandonment/harvest) through Stage 2 (20 ~ 30 years after abandonment/harvest), through Stage 3

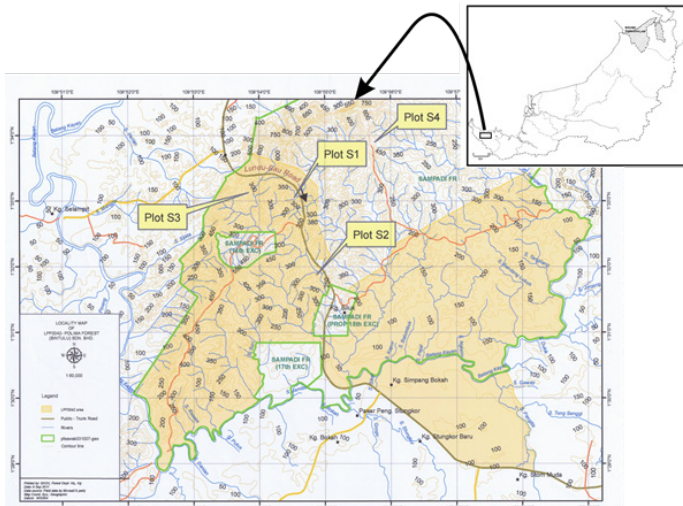


Fig. 1 Location of study sites at the Sampadi-Lundu Forest Reserves, Sarawak.

(30 ~ 40 years after abandonment/harvest) through Stage 4 (~50 years after abandonment/harvest) to Stage 5 (climax tropical rainforest). The trend(s) of species succession in *A. mangium* forests after different duration of abandonment would give us a good picture of pioneer tree species that come to colonize the prevailing canopy openings in such forests, to what extent those pioneer tree species contribute to the succession processes, and to what magnitude in terms of species richness and similarity in the succession continuum.

PHASE 3

We believe that *A. mangium* forest plantations serve as epicenters for the migration, hitherto invasion into forest openings and open spaces as well as derelict areas in the rural and townships of Malaysia. This is especially evident along the roads, highways and openings in the townships. These new populations of *A. mangium*, are in fact,

satellite populations which at some stage act as new epicenters for further invasions. What were once *A. mangium* forests have been also planted with *A. auriliformis*, and a lot of hybridization has taken place between them.

The invasiveness of these *Acacias* is of concern to the authorities in Sarawak in particular and in Malaysia in general.

We took the initiatives to map *Acacia* aggregates in Sarawak based on presence/absence data on the incidence(s) of especially along the roads, highways, new townships and derelict farm areas. This led to population census/survey of *Acacia* spp. aggregates from Sematan in the western frontier of Sarawak to Lawas in eastern Sarawak. These data will be augmented by spectral analyses of satellite imaging of *Acacia* species aggregates in the state of Sarawak.

Based on my discussions with the Director and Deputy Director II, Sarawak Forest Department

recently, 2 or possibly 3 forest officers/researchers wish to pursue the above research (Phase 2 & Phase 3) at the MSc/PhD level locally or abroad.

We hope after gathering these data and presenting them to the authorities in the state, mitigation programmes to arrest further invasion of Acacia species aggregates could be instituted by the relevant authorities in Sarawak in particular.

Based on current estimates of spending, it would be reasonable to request further funding from PRO NATURA FOUNDATION JAPAN to support the remaining part of Phase 2 and Phase 3 of research activities to be carried on in earnest.

The location of study sites in the Sampadi-Lundu Forest Reserves and the Acacia plantations nearby is shown in Fig. 1.

放棄ゴム園とアカシア植林地の自然再生に関する研究

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マレーシア半島部、及びサラワク州において、それぞれ放棄ゴム園とアカシア植林地の自然再生過程について研究を行った。放棄ゴム園の自然再生過程についてはマレーシアセランゴール州、ネグリセンビラン州、連邦特別区（クアラルンプール）で調査を行い、この結果については第一次報告書で報告したが、アウトリーチとしては Nurfilza Nasir 氏が本プロジェクトの一環として修士論文を作成し（2012年2月までに提出予定）、学術雑誌に投稿できるまでになり得たことである。

第2フェーズとして放棄アカシア植林について、上記と同様の調査をマレーシア半島部で行っていたが、その後調査サイトが政府の方

針によりゴム園に転換されたため、調査対象地をサラワク州 Sampadi-Lundu Forest に変更しサラワク林業局の協力の下に研究、近隣域の自然林との比較・分析を行った。その結果、放棄後40年以上経過した植林地の種構成は、自然林と大きな隔たりが在ることが分かった。少なくとも Sarawak 州内の同じような立地条件下の森林で同様の調査が必要であることを示唆している。筆者等はこれらの結果を踏まえて、放棄植林地（農園も含めて）の回復過程と植生の連続性を明らかにするための更なるプランとして、放棄後の経過年数を細かく設定したサイト（stage 1～5まで）での研究の必要性を訴えている。

（奥田敏統訳）