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4 **Collaboration for Environmental Evidence**  
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9 **Systematic Review No. 88**  
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11 **WORKING TITLE:**  
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13 ***SCIENTIFIC BASIS FOR INTEGRATION OF PLANT***  
14 ***CONSERVATION ASPECTS INTO SOUTH EAST ASIAN***  
15 ***TROPICAL FORESTRY***  
16

17 **Draft Review Protocol**  
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## Cover Sheet

Title	<b>Working title:</b> <i>Scientific basis for integration of plant conservation aspects into South East Asian tropical forestry</i>
Systematic review	N°88
Reviewer(s)	<i>Lena Gustafsson (SLU), Yves Laumonier(CIFOR), Robert Nasi (CIFOR)</i>
Date draft protocol published on website	<i>01/02/2010</i>
Date final protocol published on website	
Date of most recent amendment	
Date of most recent SUBSTANTIVE amendment	
Details of most recent changes	
Contact address	<i>Swedish University of Agricultural Sciences, Department of Ecology, P.O. Box 7044, SE-750 07 Uppsala, Sweden</i>
Sources of support	<i>The Swedish Research Council Formas, Sida (Swedish International Development Cooperation Agency)</i>
Conflicts of interest	<i>None</i>

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## 43 1. Background

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45 The concept of sustainable extraction of timber from tropical forests is almost as old as  
46 tropical forestry itself. In South East Asia at present though, sustainable forest  
47 management principles are not often fully applied and instead in many regions there is  
48 a rapid deforestation, illegal logging and non-considerate practices.

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50 During the last 20 years a number of new instruments and tools (e.g. Criteria and  
51 Indicators, Codes of Practices and Reduced Impact Logging) have been developed  
52 that are being increasingly used by governments, logging companies, and non-  
53 governmental organisations. The recommendations are mostly directed to reduce  
54 negative impacts on regeneration, soil and to certain extent water, and thus sustainable  
55 forest management from a production viewpoint is often in focus. There are examples  
56 of guidelines for sustainable forestry incorporating a wide array of environmental  
57 aspects (e.g. ITTO, 2005) but there is still a need to develop recommendations  
58 specifically targeted towards biodiversity (Dennis *et al.*, 2008).

59

60 If biodiversity-oriented recommendations are to be relevant and efficient, they need to  
61 rest on a solid scientific basis regarding the biological characteristics, habitat demands  
62 and critical factors for species, and also on the ecological processes and patterns that  
63 are the drivers of tropical rainforest ecosystems.

64

65 The fauna is considerably much more studied in South East Asia than plants. One  
66 example of this is the book on Southeast Asian biodiversity by Sodhi & Brook (2006),  
67 in which the chapter on impact of habitat degradation on biotas has 5 pages on plants  
68 and 30 on animals. The authors also state that it is surprising that the vascular plants  
69 are among the least studied biotas in South East Asia and that more research on them  
70 is critical. CIFOR (Center for International Tropical Forestry Research) in 2004  
71 published the book “Life after Logging” (Meijaard *et al.*, 2005) which summaries  
72 knowledge on the fauna of Borneo, using it to suggest a number of adjustments for  
73 practical forestry (updated in Gustafsson *et al.*, 2007). Many of these adjustments also  
74 benefit the flora but if botanical considerations are to be effective, specific knowledge  
75 on plant ecology needs to be incorporated. Even if there is still a huge lack of basic  
76 ecological insight regarding plants, it is valuable to summarize current knowledge.

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## 79 2. Objective of the Review

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81 The rationale for the review is that it is vital to consider stand/compartments and  
82 landscape factors when conducting forestry in the tropics, if plant diversity is to be  
83 maintained and promoted. The identification of such critical factors is the aim of the  
84 review. We focus on the dipterocarp forests of South East Asia which are the  
85 dominating timber source in this part of the world. Lowland as well as hill dipterocarp  
86 forests are in target, but many of the results can be transferred to also other forest  
87 types and regions.

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### 89 2.1 Primary question

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91 *Which are the critical factors for the long-term survival of tropical plant populations*  
92 *in South East Asian dipterocarp forests that are affected by practical forestry?*

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## 2.2 Secondary question

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### 1. Which are the critical habitats?

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98 There are numerous definitions of “habitat”, all more or less similar. In this context  
99 habitat means “An environment in which a species normally occurs”. For plants this  
100 means that it is an easily delimited and recognizable environmental unit with homogenous  
101 conditions regarding abiotic (geology, climate etc.) and biotic (other plants and animals)  
102 factors. Habitats can be very broad like “wetland” or “forest” but also more narrow like  
103 “steep rock-surface close to waterfall” (for a lichen species) or shady large-diameter  
104 dipterocarp tree stem (for an orchid).

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### 2. Which are the critical processes?

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108 Processes are dynamic driving forces often at the ecosystem level or higher that are  
109 fundamental to populations, species and communities. They can be biotic (e.g. insect and  
110 pathogen outbreaks) or abiotic (e.g. nutrients and energy cycling). There are  
111 anthropogenic processes, e.g. forestry, and natural ones. Since this review concerns  
112 critical factors for plants and their prerequisites have been developed through  
113 evolutionary processes in natural environments, only natural processes are considered.  
114 Examples of processes are *pollination* (presence of pollinators), *dispersal* (presence of  
115 dispersal agents like ants, birds) and *natural disturbance* (e.g. fire, drought, flooding,  
116 wind).

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118 Landscape-scale patterns, e.g. fragmentation, connectivity and other factors relating to  
119 metapopulation and metacommunity dynamics, can be of decisive importance to the  
120 presence and long-term persistence of biodiversity. The knowledge on such patterns is  
121 emerging rapidly for the fauna, and has been started to be recognized also for plant  
122 species. Still, there are very large gaps of knowledge, not the least for the Asian tropical  
123 region. Nevertheless, any indications found during the literature search on the importance  
124 of landscape properties are included under the secondary question “critical processes”.

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## 3. Methods

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### 3.1 Search strategy

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132 Searches are made in the bibliographic library databases Agris, Biosis previews and CAB  
133 abstracts, and also from the web-engine Google Scholar. Table 1.

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Table 1. Bibliographic databases that are used in the literature review.

Database	Description
Agris (ERLWebSPIRS, Silver Platter)	Produced by FAO, input by 240 national, international and intergovernmental centres. Via SLU libraries. Number of records November 2006 >2.3 million. Years: 1975- . Subjects: agriculture, forestry and wood, veterinary medicine. Publication types: Journal articles, non-conventional documents, books, dissertations. Updated quarterly.

Biosis previews	(Web of Knowledge). Producer: Thomson (ISI). Via SLU Libraries. Years: 1989-. Number of records November 2006 >9.7 million. Subject: Biology. Publication types: Journal articles, books, conference proceedings, patents (USA). Updated weekly.
CAB abstracts (Web of Knowledge)	Produced by CAB International (CABI). Via SLU Libraries. Years: 1973-. Number of records >5 million. Subjects: Agriculture, forestry and wood, veterinary medicine. Publication types: Journal articles, books, conference proceedings, reports. Updated monthly.
Google Scholar search engine	Research material stored in data-bases of publishers, libraries and websites. Peer-reviewed papers, theses, abstracts, technical reports. Lists the number of times the publication has been cited, links are given to the abstract, to libraries holding a book and to other often more preliminary versions of the article. The records are shown in order relevance, weighed regarding the full text, author, the publication and number of citations.

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The Google database consists of records from journals, books, web publications etc and is very large. Thus, it is impossible to include all and a limit has been set to the first 50 for each search string. The search strings are a combination of taxonomic groups and geographic areas. Table 2.

Table 2. Search strings

	plant* and dipterocarp* and forest*	bryophyte* and dipterocarp* and forest*	fungi and dipterocarp* and forest*	hepatic* and dipterocarp* and forest*	lichen* and dipterocarp* and forest*	moss* and dipterocarp* and forest*
Asia						
Burma						
Cambodia						
China						
Indochina						
Indonesia						
Laos						
Malaya						
Malaysia						
Malesia						
Myanmar						
Philippines						
Singapore						
Thailand						
Vietnam						

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143 All records retrieved in the different searches are merged into one EndNote database and  
144 duplicates are removed. The records are evaluated regarding relevance from the following  
145 predefined criterion; “Knowledge related to critical habitats and processes for plant  
146 biodiversity in dipterocarp forests in South East Asia and that is relevant to consider in  
147 biodiversity-oriented guidelines for forestry”, based on the title, and if this is not  
148 informative, on the abstract, if available. Those remaining after this first filtering, and  
149 available electronically through SLU library or at the CIFOR library, are re-examined for  
150 relevance based the same criterion, from the whole text and if this is not possible, again  
151 from the abstract. Additional references are successively added from cross-references,  
152 library visits to study paper copies, reading of journals etc. These are analysed based on  
153 the same criterion as for the other articles. They are during the work process kept in a  
154 separate database but at the end are merged with the database formed from the  
155 bibliographic searchers, to form a final reference list. The initial separation into different  
156 EndNote databases is done in order to enable estimates of number of retrieved reference  
157 from the systematic searchers versus the ones retrieved from cross-references.

### 158 159 **3.2 Study inclusion criteria**

#### 160 161 • **Relevant subject(s):**

162 Plants are the target species, in this context including the taxonomic groups of  
163 vascular plants, bryophytes, lichens and macrofungi (fungi forming macroscopic  
164 fruit bodies). The geographical scope is South East Asia and the broad forest type  
165 is the tropical moist dipterocarp forest (lowland and hill). Many forest species are  
166 light-tolerant and thus well adapted to logging, i.e. they can be promoted if the  
167 canopy is opened up and the soil is disturbed. Consequently, in this study, less  
168 common species and species communities belonging to mature forests that are  
169 believed to be vulnerable to forestry are in target.

#### 170 • **Types of intervention:**

171 The review is being made for the purpose of developing biodiversity-oriented  
172 guidelines for tropical forestry. Thus, forestry (planning, logging, post-logging  
173 operations) is the target intervention type. Consequently, the questions posed are  
174 such that the answers are relevant to forestry actors and applicable on forestry  
175 measures in South East Asian tropical moist dipterocarp forests.

#### 176 • **Types of comparator:**

177 Not relevant

#### 178 • **Types of outcome:**

179 Habitats and processes.

#### 180 • **Types of study:**

181 Scientific journal articles, books, technical reports, governmental and non-  
182 governmental reports, various types of grey literature from South East Asia  
183 universities and institutions.

### 184 185 **3.3 Potential effect modifiers and reasons for heterogeneity:**

186  
187 Not relevant

### 188 189 **3.4 Study quality assessment**

190 For the finally kept references, an assessment is made of their quality in a four-  
191 graded scale regarding relevance as well as scientific quality. Relevance quality is  
192 divided into two types: “subject” related to the plant groups and forest type, and

193 “outcome” related to how valuable the knowledge is for biodiversity-oriented  
 194 recommendations. Table 3.

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Table 3. Quality criteria into which the references were classified.

<b>Rank (1=highest, 4=lowest)</b>	<b>Relevance quality</b>	<b>Scientific quality</b>	
	<b>Subject</b>	<b>Outcome</b>	
1	Dipterocarp forests in South East Asia. Vascular plants and/or bryophytes and/or fungi and/or lichens.	Adds important new important information on critical factors and habitats that is valid but has not yet been considered in codes of practices, certification standards etc in South East Asia.	Well designed study (experimental, correlative, survey) with appropriate population size and relevant statistical or other data analysis
2	Dipterocarp forests in South East Asia, solely or in combination with other types of tropical forests in Asia. Vascular plants and/or bryophytes and/or fungi and/or lichens.	Adds some new information on critical factors and habitats that is valid to be considered in codes of practices, certification standards etc in South East Asia.	Rather well designed study (experimental, correlative, survey) with suboptimal population size and/or less relevant statistical/other analysis
3	Tropical forests in Asia, solely or in combination with tropical forests on other continents. Vascular plants and/or bryophytes and/or fungi and/or lichens.	Adds only limited new information on critical factors and habitats that is valid to be considered in codes of practices, certification standards etc in South East Asia.	Descriptive and explorative study without a stringent design but still with high credibility regarding taxonomy and/or knowledge of ecological conditions. Lacks or has weak statistical or other analysis
4	Tropical forests but with a sub-ordinate role, although valid, for Asian conditions. Vascular plants and/or bryophytes and/or fungi and/or lichens.	Adds no new information but supports existing knowledge valid to be considered in codes of practices, certification standards etc in South East Asia.	Weak methodology (design, sample size).

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### 3.5 Data extraction strategy

We have no intention to make a meta-analysis; instead our systematic review is qualitative, and the finally kept references are analysed and reported in a

204 narrative way. The subject is broad, with references varying from textbooks to  
205 small-scale correlative studies, which precludes a quantitative approach. The  
206 large advantage of the systematic protocol is that 1) our literature retrieval is  
207 made in a planned and strictly organized way, 2) the criteria for literature  
208 searches and inclusion of references are clear, 3) the procedure is transparent.  
209

210 It is very likely that cross-references from literature retrieved during the initial  
211 searches will be very important.  
212

### 213 **3.6 Data synthesis and presentation**

214  
215 The knowledge is synthesized in a narrative way.  
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## 218 **4. Potential Conflicts of Interest and Sources of Support**

219  
220 None.  
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## 223 **5. References**

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