

## RNRRS PROJECT COMPLETION SUMMARY SHEET

26 March 1998

**TITLE OF PROJECT:** LARST Forestry Phase II: operational fire information system

**DFID Project Reference Number:** R6326

**RNRRS PROGRAMME:** Forestry

**PROGRAMME MANAGER:** Natural Resources International Limited

**SUB-CONTRACTOR (if relevant):** Natural Resources Institute

**RNRRS PROGRAMME PURPOSE:** Tropical moist forests sustainably managed

**RNRRS PRODUCTION SYSTEM:** Tropical Moist Forest

**COMMODITY BASE:** Timber/non-timber forest products

**BENEFICIARIES:** Forest dependent communities, Government forestry departments, timber concessionaires, global science community

**TARGET INSTITUTIONS:** Provincial forestry departments, park managers and logging concessionaires

**GEOGRAPHIC FOCUS:** Indonesia

	<b>Planned</b>	<b>Actual</b>
<b>START DATE:</b>	<b>May 1, 1995</b>	<b>May 1, 1995</b>
<b>FINISH DATE:</b>	<b>March 31, 1998</b>	<b>March 31, 1998</b>
<b>TOTAL COST:</b>	<b>£174,419</b>	<b>£174,419</b>

### 1. Project Purpose:

Project activities are aimed at mitigating the problem of fire damage to forests, and tropical moist forest in particular. Fire, from both man and natural causes, results in major losses of forest resources in all global ecosystems, most especially in areas where humans are active, such as in logging and at forest-agriculture interface. It is recognised at government Minister level in Indonesia that there is need for comprehensive information on the scale and the extent of the fire problem, for policy formulation, development of strategy, etc. There is a need for up to date information on the fire activity (location, extent, damage) at provincial and local forestry level, at concessionaire level and at farmer level. The Natural Resources Institute has received many requests for information and support with satellite forest fire monitoring techniques from forest departments around the world. Phase I (R5072) demonstrated the value of practicality of local satellite fire detection methods. It stimulated utilisation by provincial forest department staff and concessionaires and provoked specific demand from Indonesians for improvement in information quality, reliability and speed of dissemination. This project was aimed specifically at **improving information availability and reliability to Provincial Forestry Department staff and its rapid dissemination to concessionaires as part of the overall strategy towards sustainable management of the logged tropical moist forests in Indonesia.**

### 2. Outputs:

The project's overall objective was to **improve fire information and reliability to the provincial forestry department in Indonesia.** The specific objectives were:

- 1) Improve software methods for fire detection, cloud removal, fire risk and burn scars assessment;
- 2) Develop operational NOAA satellite fire detection system, test and promote it in Indonesia with local staff trained in system operation and information use;
- 3) Improve technical capability for converting fire data into useful information and improve dissemination routes for timely response;
- 4) Improve integration of fire information with other data sets towards images and resource accounting;
- 5) Improve techniques for fire and fire scar area validation;
- 6) Integrate better fire monitoring activities through improved understanding of technical, institutional, social and economic considerations for sustainable and effective fire monitoring within the national strategy for sustainable management of logged forest;
- 7) Smooth uptake pathways through existing TC project activities and related EC projects in the region, with practical implementation procedures for operators, managers and logging concessionaires;
- 8) Work towards better local protection and support of hardware and software.

### 3. Contribution of Outputs to Project Goal:

Objectives 1-5 were achieved. The project partially achieved objectives 6 to 8 where the project was heavily relying on Indonesian and other TC and EU projects input whose priorities were taken into account during project activities. The project however enabled better access to improved information essential for **sustainable management of tropical moist forest.**

*Active Fire Detection.* A new approach was developed (the contextual fire detection algorithm) to reliably detect active fires from NOAA-AVHRR data (objective 1). Automated user-friendly modules, based on the above technique, were produced in Bahasa Indonesia, and adapted to fit local environment. Modules were installed and staffs were trained at two receiving stations (Palangka Raya, Central Kalimantan and Jakarta, Java). These have been providing fire information since 1995 and 1996 respectively to the Ministry of Forestry. At the end of the project, two other similar modules were requested from two other projects and installed subsequently (objective 2, 6, 7). A similar approach has since been used in Nicaragua. The international community (e.g., the International Geosphere Biosphere Programme-IGBP) also uses the contextual approach to produce global fire activity maps. Validation issues were of concern to both NRI and Indonesian parties. Some isolated validation exercises demonstrated successful active fire and burn scar detection. Comprehensive validation did not take place due to areal survey restrictions in country and different priorities in technical co-operation projects (objective 5).

*Fire Risk Assessment.* New approaches using NOAA-AVHRR data were developed and adapted for the estimation of vegetation status in terms of water content, important parameters in the assessment of fire risk. Maps of vegetation status over Sumatra were produced and demonstrated to local staff, intending to include such approach in their daily management (objective 1).

*Burn Scars Assessment.* Burn scars assessment only appeared of interest to the Indonesian parties in the very late stages of the project, after important fire events in late 1997 and early 1998. The project collaborated with the EUFREG project in detecting burned areas from AVHRR, using SPOT imagery as validation tools (objective 1, 4, 6 and 7).

*Improved fire related information.* Techniques were developed and implemented (and staff trained), using GIS and databases, for automated and fast delivery of active fire information, as well as for production of active fire statistics in relation to local issues (e.g., type of forest, concessions). The project also contributed to the development of *Standard Operation Procedures* of data flow between the ground stations and the Ministry of Forestry. Information on active fire and vegetation status combined with local data were used to show regions with different level of risks of fire occurrence where action or prevention must be focused according to the means available (objectives 3, 4, 6 and 7).

#### **4. Publications:**

##### Journal papers

Wooster, M., P. Ceccato and S. Flasse (1998) 'Indonesian fires observed using AVHRR' *International Journal of Remote Sensing*, 19(3), 383-386.

Downey, I. D., P. Ceccato, S. P. Flasse, P. Navarro, S. N. Trigg, and J. B. Williams (1996) 'Real time monitoring of active forest fires for better natural resource management in developing countries', *Advances in Remote Sensing*, 4(4), 76-83.

Flasse, S. P. and P. Ceccato (1996) 'A contextual Algorithm for AVHRR fire detection', *International Journal of Remote Sensing*, 17(2), 419-424.

##### Conference and workshop Proceedings

Trigg S. N. and Schneider H. M. (1995) 'Towards operational forest monitoring in Indonesia using local reception of NOAA satellite data, Proceedings' in *Proceedings of the Conference on Remote Sensing and GIS for Environmental Resources Management - the Indonesian-European Experience, BPPT Jakarta, Indonesia, 6-8 June 1995*, p. 9.3.

Ceccato, P., S. P. Flasse and I. Downey (1995) 'Fire detection with AVHRR: A useful contextual algorithm' in *Proceedings of The 1995 Meteorological Satellite Data Users' Conference, Winchester, UK, 4-8 September 1995*, EUMETSAT, Germany, 101-108.

Downey, I. D., P. Ceccato, S. P. Flasse, P. Navarro, S. N. Trigg, and J. B. Williams (1995) 'Real time monitoring of active forest fires for better natural resource management in developing countries' *EARSel Remote Sensing and GIS Applications in Forest Fire Management, 7-9 September 1995, Alcalá, Spain*, 22-26.

Downey, I. D., S. P. Flasse, P. Ceccato and S. N. Trigg (1995) 'Real time monitoring of active forest fires for better natural resource management' *Remote Sensing Society Conference, 11-14 September 1995, Southampton, UK*, 275-282.

Raimadoya M. A. and S. P. Flasse (1996) 'The use of NOAA AVHRR data for fire detection in Kalimantan and Sumatra' in *Proceedings of workshop on Direct Reception of Satellite Data for Integrated and Sustainable Environmental Monitoring in Indonesia, April 16, 1996, BPP Teknologi, Jakarta, Indonesia*, S. Trigg and I. Farahidy (Eds.), BPP Teknologi, Jakarta, Indonesia, 12/1-10.

Flasse, S. P., P. Ceccato, I. D. Downey, J. B. Williams, P. Navarro and M. A. Raimadoya (1996) 'Remote sensing and GIS tools to support vegetation fire management in developing countries' in *Proceedings of the 13th Conference on Fire and Forest Meteorology, 27-31 October 1996, Lorne, Australia*, in press.

Flasse, S. P., P. Ceccato, I. D. Downey, M. A. Raimadoya, and P. Navarro, (1997) 'Remote sensing and GIS tools to support vegetation fire management in developing countries' in *Proceedings of IGARSS'97, 03-08 August 1997, Singapore*, 1569-1572.

Ceccato, P. (1998) 'Development of new methodologies for the estimation of fire risks' in *Proceedings of Forest Fire Prevention and Control Project Final Workshop for Phase 1, 24-25 February 1998, Palembang, Indonesia* (both in English and Bahasa Indonesia)

Ceccato, P., S. P. Flasse, I. D. Downey, D. Wall, and I. Anderson (1998) 'Effective tools for monitoring of vegetation fires in Sumatra (Indonesia)' in *Proceedings of the 27th International Symposium on Remote Sensing and Environment, June 8-12, 1998, Tromsø, Norway*, in press.

#### Others

Rosenberg, L. J. and I. D. Downey (1996) 'Remote sensing and GIS for natural resources management' Feature article in *Remote Sensing Society newsletter*, Winter 1996.

Downey, I. D., S. P. Flasse and P. Ceccato (1996) 'LARST for Fire Management' Poster presented at the ODA NR Advisers annual conference at Sparsholt in July 1996.

#### **5. Internal Reports:**

P. Ceccato (October 1997) 'Preliminary Results using Relative Greenness Index to estimate Fuel Moisture Content. EXPRESSO: Biomass Burning Group' Technical report.

P. Ceccato (November 1997). 'Development of fire risk and fire danger assessment for Indonesia. First phase report: Analysis of fire patterns in Indonesia for two seasons (1996-1997)' Technical report.

P. Ceccato, P. Navarro and S. Flasse (December 1997) 'Development of fire risk and fire danger assessment for Indonesia. Final report including results and methodologies' Technical report.

P. Ceccato (March 1998) 'Development of a methodology to detect Burn Scars using NOAA-AVHRR Data (case study, Southern Sumatra)' Technical Report, EUFREG Phase II.

#### **6. Other Dissemination of Results:**

N/A

#### **7. Follow-up indicated/planned:**

In addition to the dissemination products recorded above, one paper will be presented at an international conference, and two papers will be submitted for publication in scientific journals.

Current implementation would benefit from a comprehensive validation programme of active fire and burn scar detection, as well as a better coordination between the various TC and NGO projects in country, and Indonesian parties.

#### **8. Name and signature of author of this report**

*Stéphane Flasse*