



# **CRC 990 - EFForTS**

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## **NEWSLETTER**

Issue 2 / May 2014



## Note / Acknowledgement from the Speakers

Dear CRC colleagues,

Due to the help of all of you we are very happy to be able to present the second issue of the Newsletter.

The second issue is a progress report highlighting the status quo and the significant achievements obtained at the end of the first half of the project period.

Enjoy reading!

*Stefan Scheu (Speaker of the CRC 990),*

*Anas M. Fauzi (Speaker Indonesian University Consortium of the CRC 990)*

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## I. Research Activities of the CRC 990 – State of the Art

### 1. Research Activities of Groups A, B, C, Z02, INF

#### FIELDS OF RESEARCH

- Environmental processes (group A)
- Biota and ecosystem services (group B)
- Human dimensions (group C)
- Central Scientific Support Unit (Z02)

#### GROUP COORDINATORS

- **group A:**  
Alexander Knohl, Edzo Veldkamp (University of Göttingen, UGoe); Suria Darma Tarigan (Bogor Agricultural University, IPB); Ermadani (University of Jambi, UNJA)
- **group B:**  
Teja Tscharntke, Holger Kreft (UGoe); Leti Sundawati (IPB); Bambang Haryadi (UNJA)
- **group C:**  
Meike Wollni, Heiko Faust (UGoe); Nunung Nuryartono (IPB); Rosyani (UNJA)

#### HIGHLIGHTS GROUP A

- \* Sediment cores have been described lithologically and tested for pollen. AMS (Accelerator Mass Spectrometry) radiocarbon dating revealed that the peat dome near Bukit Duabelas is ca. 8000 years old.
- \* A standard sap flux method for oil palm was successfully calibrated.
- \* The final climate tower (22 m high) has been built at PTPN VI – Batang Hari Unit, in a 12 years old oil palm plantation. The tower is equipped with full meteorological measurements, including a profile for air temperature and humidity, and wind speed at different heights. Measurements at the tower have been running since March 2014.
- \* First results of carbon (C) stocks and turnover demonstrate that C in top soil decreases with land-use intensity. Soil microbial activity is lower in transformation systems. Significant soil erosion occurred in the transformation systems in the the Harapan landscape.
- \* Conversion of rainforest to monoculture systems of oil palm and rubber plantations altered soil CO<sub>2</sub> and CH<sub>4</sub> fluxes. In both landscapes, soil CO<sub>2</sub> fluxes from oil palm were lower compared to the other land-use systems. CH<sub>4</sub> uptake in the forest was higher than in rubber and oil palm for the Bukit Duabelas landscape.
- \* In both landscapes net N cycling rates were higher in the forest than in the land-use systems whereas NO<sub>3</sub>- leaching losses were higher in oil palm plantations.

## Group A

### A01

**TITLE: Prehistoric and historic rainforest transformations of the Jambi landscape**

**TEAM:** Principle Investigators: Hermann Behling (UGoe); Supiandi Sabiham (IPB); Asmadi Saad, Yudhi Achnopha (UNJA)  
**Scientific staff:** Siria Biagioni, Kartika Hapsari (PhD students)

#### PROGRESS / CURRENT STATUS

- Second field work campaign completed (4 sediment cores have been taken from 3 new locations and moved to the University of Göttingen, 64 pollen traps installed in the EFForTS-CRC990 plots)
- The new sediment cores have been described lithologically and tested for pollen. 16 samples sent to AMS-Laboratory in Erlangen for AMS radiocarbon dating
- AMS dating of the sediment core Jaw SPT (PT-Emal, close to Bukit Duabelas) reveals the peat dome is ca. 8000 years old. The same core is currently under study for analyzing pollen and spore (Siria Biagioni), testate amoebae (Valentyna Krashevskaya, subproject B08) and C/N and 15N (Asmadi Saad in collaboration with subproject A05)



Team at work at Danau Bento, Kerinci, Jambi (September 2013)

- The sediment core Sungai Buluh B (Kawasan Hutan Lindug Gambut) is under study for pollen and spore (Kartika Hapsari) and C/N (in collaboration with the MARUM centre, Bremen). Three data loggers were installed along a transect from peat dome peak to oil palm plantation close to the coring location. Data loggers recording water table and physical parameters since November 2013
- The proposal from Asmadi Saad-counterpart at UNJA-has been granted by the CRC 990: *Tropical modern pollen collection as a tool to interpret the Quaternary fossil pollen records in Sumatra (Indonesia)*
- Collaboration started with subproject B09 on the investigation of pollinators-plant interactions in rainforest and rainforest transformation systems.

A02



#### TITLE: Tree and palm water use

**TEAM:** Principle Investigators: Dirk Hölscher (UGoe); Herdhata Agusta, Hendrayanto (IPB); Heri Junedi (UNJA)  
**Scientific staff:** Alexander Röhl, Andrea Hanf, Niu Furong, Afik Hardanto (PhD students)

#### PROGRESS / CURRENT STATUS

- Field work is completed
- Tree and palm sap flux were measured on both the 32 core plots and 14 additional locations (e.g., oil palm plantations of different age)
- Measurements are ongoing in four monitoring plots (BR3, BJ5, BO3, BF3) and at the new Eddy-Tower location (A03) in PTPN VI
- Niu Furong successfully calibrated a standard sap flux method for oil palm

A03



New climate tower at PTPN VI

#### TITLE: Influence on local and regional climate

**TEAM:** Principle Investigators: Alexander Knohl, Oleg Panferov (UGoe); Tania June (IPB); Pak Irianto, Heri Junedi (UNJA); Abdul Rauf (UNTAD); Dodo Gunawan (Badan Meteorologi Klimatologi, Dan Geofisika – BMKG)  
**Scientific staff:** Ana Meijide, Merja Tölle (Postdocs); Yuanchao Fan, Clifton Sabajo (PhD students), Edgar Tunsch (Technician)

#### PROGRESS / CURRENT STATUS

- The small/temporary climate tower established in Pompa Air in a young oil palm plantation was running for 7 months (July 2013-February 2014) and now has been dismantled. Data are currently analyzed by Ana Meijide and Tania June.
- The final climate tower has been built in PTPN VI – Batang Hari Unit, in a 12 years old oil palm plantation. Measurements at the tower have been running since March 2014. It is a 22m tower, equipped with full meteorological measurements, including a profile for air temperature and humidity and wind



speed at different heights. We are performing CO<sub>2</sub> and H<sub>2</sub>O measurements, both with eddy covariance at the top of the tower and using a profile system which measures concentrations at different heights.

- Methane eddy covariance measurements have not yet started because there is not enough power to run the methane analyzer. Negotiations are taking place to rebuild the power line in order to have enough power to run all the equipment.
- Collaborations have been established in PTPN VI – Batang Hari Unit with A02 and A05 subprojects, who are also measuring at the site.
- Investigation of surface biophysical characteristics such as surface roughness, transfer coefficient, intensity of turbulence, radiation interception and distribution, energy budget, microclimate and water fluxes across forest, young and mature oil palm plantation using remote sensing and micrometeorology (Tania June, IPB)

#### A04

#### TITLE: **Stock, turnover and functions of carbon**



TEAM: **Principle Investigators:**  
Yakov Kuzyakov (UGoE);  
Kukuh Murti Laksono (IPB);  
Muhammad Damris (UNJA)  
**Scientific staff:** Thomas Guillaume  
(PhD student)

#### PROGRESS / CURRENT STATUS

- All soil samples are exported
- Sampling of soil water until July 2013
- Laboratory analysis started (SOM quality & incubation experiment)
- Soil analysis of household plantations in collaboration with C01 is finished.
- 2 Proposals from counterparts granted by the CRC 990
  - Muhammad Damris (UNJA): *Dynamics of Labile Fraction of SOC of Tropical Lowland Rainforest Transformation Systems in Bukit Duabelas National Park*
  - Kukuh Murti Laksono (IPB): *DOC in the Bukit Duabelas National Park and the Relation-*

*ship with the Soil Properties and its Toposequence*

#### First results

- C in top soil decreases with land-use intensity
- Significant soil erosion in oil palm and rubber plantations in Harapan Landscape
- Decrease of soil microbial activity in transformation systems

## A05

**TITLE: Trace gas fluxes and soil N cycling under rainforest transformation systems**

**TEAM:** Principle Investigators: Marife D. Corre, Edzo Veldkamp (UGoE); Iman Rusmana (IPB); Muhammad Damris (UNJA); Sri Rahayu Utami (University of Brawijaya – UB); Aiyen Tjoa (UNTAD)

Scientific staff: Kara Allen, Evelyn Preuß, Syahrul Kurniawan (PhD students)

**PROGRESS / CURRENT STATUS**

- Fieldwork in Indonesia complete
- Proposal from counterparts granted by the CRC 990
  - Aiyen Tjoa (UNTAD) and Sri Rahayu Utami: *Field Decomposition of pruned oil palm frond and its nutrients release pattern*
- Soil trace gas flux measurement complete
  - Our results showed that conversion of rainforest to monoculture systems of oil

palm and rubber plantations altered soil CO<sub>2</sub> and CH<sub>4</sub> fluxes. In both landscapes, soil CO<sub>2</sub> fluxes from oil palm were lower compared to the other land-use systems. CH<sub>4</sub> uptake in the forest was higher than in rubber and oil palm for the Bukit Dua-belas landscape.

- Analysis of leaf axil trace gas samples under process
- <sup>15</sup>N diffusion complete
  - Preliminary results indicate that in both landscapes net N cycling rates were higher in the forest than in the land-use systems, while gross N cycling rates varied across landscapes and land-uses.
- Laboratory analysis of point soil samples is in progress
- Laboratory analysis of soil water is in progress
  - Preliminary results indicate that the conversion of rainforests to oil palm plantations increased NO<sub>3</sub>- leaching losses in both landscapes, which was supported by their surficial fine-root distribution.





## HIGHLIGHTS GROUP B

- \* Inventory of aboveground woody biomass and carbon stocks is finished
- \* Preliminary results on spatial pattern and fragmentation of land use change in the Jambi province in the last 21 years are available. A full coverage of RapidEye satellite imagery within the study areas Bukit Duabelas and Harapan landscape is available.
- \* Plant survey in the Bukit Duabelas landscape is completed. All trees within 22 core plots are measured (structure and position), and preliminary identified to morphospecies. All plants within all subplots in 22 core plots are counted, measured (height), and identified to morphospecies. About 60,000 (standardized) plant pictures have been taken for online identification guide / field guides. 4035 herbarium specimen have been sent to the BIOTROP herbarium at Bogor for identification, labeling, and preparation on herbarium paper.
- \* *Clidemia hirta* (an invasive shrub) was not found in Harapan forest plots.
- \* Bird diversity declined along the transformation gradient (forest to jungle rubber to both oil palm and rubber plantations). The large scale ant and bird exclusion experiment in oil palm showed a marked impact of birds and ants on yield.
- \* A coupled ecological-socio-economic simulation model is being conceptualized including an agent-based household model and a landscape generator that produces artificial land-use maps and land-ownership maps. Data from household survey (C07) are used to derive model parameters.

## Group B

B01



**TITLE: Structure, stability and functioning of macro-invertebrate communities in rainforest transformation systems in Sumatra (Indonesia)**

**TEAM:** Principle Investigators: Ulrich Brose (UGoe); Achmad Farajallah, Tri Heru Widarto, Noor Farikhah Haneda (IPB)  
Scientific staff: Andrew Barnes, Malte Jochum (PhD students)

## PROGRESS / CURRENT STATUS

- Export permit recommended by LIPI and granted by the Ministry of Forestry
- Export of samples upcoming
- After successful shipping to Germany: stable isotope and stoichiometry analyses planned
- First overview paper on macro-invertebrate responses to land use change in preparation: diversity, density, biomass, body mass and energy usage of communities along forest-transformation gradient

B03



**TITLE: Plant genetic diversity in tropical lowland rainforest transformation systems**

**TEAM:** Principle Investigators: Reiner Finkeldey (UGoe); Iskandar Z. Siregar (IPB); Sri Rahayu, Ulfah J Siregar, Utut Widyastuti, Hamzah Saidina, Zainuddin Zulkarnain, Bambang Irawan (UNJA)  
Scientific staff: Natalie Breidenbach (PhD student)

## PROGRESS / CURRENT STATUS

- Sampling of 30 out of 32 core plots is completed: 112 different species with 3000 samples
- Lab work of the 3000 samples is nearly finished
- Genotype scoring of the 3000 samples is in progress
- Bachelor Student (IPB Bogor) is examining *Alstonia scholaris* (90 samples) and *Macaranga triloba* (100 samples) Herbarium specimen for leaf character variability

B04



**TITLE: Carbon sequestration, litter C input to the soil, and resource use-efficiency**

**TEAM: Principle Investigators:** Dietrich Hertel, Christoph Leuschner (UGoE); Cecep Kusmana, Triadiati Antono, Elias (IPB); Rahmi Dianita (UNJA)

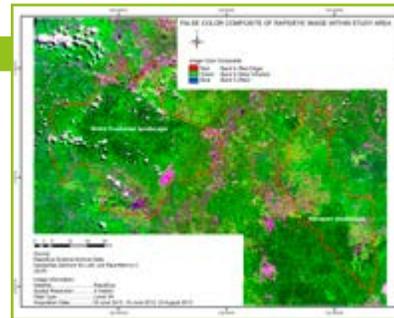
**Scientific staff:** Bernhard Schuldt (Postdoc); Martyna Kotowska, Yasmin Abou Rajab (PhD students)

#### PROGRESS / CURRENT STATUS

- Master students (Yuna Pransiska, Selis Meriem) working on vertical root distribution, contribution of coarse roots to the soil carbon pool and contribution of dead wood to biomass and carbon stocks
- Canopy cover and light measurements started in cooperation with B06
- Integration of root and stem wood anatomy in project
- Inventory of aboveground woody biomass and carbon stocks is finished
- Annual above-ground primary production as leaf litter fall, stem growth and harvest in

- plantations will be finished soon
- Investigation of belowground litter production and C and N transfer to the soil with minirhizotron technique, sequential coring and ingrowth cores is ongoing
  - Vertical root distribution will be investigated in June/July

B05



False Color Composite of RapidEye image in 2013

**TITLE: Methodological approaches to the assessment of all tree resources in transition systems in forested tropical landscapes**

**TEAM: Principle Investigators:** Christoph Kleinn (UGoE); I Nengah Surati Jaya, Tatang Tiryana (IPB); Muhammad Zuhdi (UNJA)

**Scientific staff:** Lutz Fehrmann, César Pérez-Cruzado (Postdocs); Dian Nuraini Melati (PhD student)

#### PROGRESS / CURRENT STATUS

- Field measurements of inventory data in Bukit Duabelas National Park and Harapan

rainforest (PT. REKI) as well as transformation systems in surrounding area are completed

- Preliminary results on spatial pattern and fragmentation of land use change in the Jambi province in the last 21 years are available
- A full coverage of RapidEye satellite imagery within the study areas Bukit Duabelas and Harapan landscape is available (independent proposal to the RESA Science archive)
- Pre-processing and land use land cover classification based on RapidEye imagery is ongoing

#### COUNTERPART (IPB):

- Land use and land cover mapping as an improvement of land cover map produced by Indonesian Ministry of Forestry
- Evaluation of historical land use and land cover map using Landsat images by considering 4 transformation systems



Activity: dbh measurement supported by staffs of PT. REKI.  
Aim: to support above ground biomass analysis.

B06



Team B06



Camp in the forest

**TITLE: Plant diversity**

**TEAM:** Principle Investigators: Holger Kreft (UGoe); Hardianto Mangopo (IPB/UGoe); Sri Sudarmiyati Tjitrosoedirdjo, Indah Wahyuni (IPB); Bambang Haryadi (UNJA)  
**Scientific staff:** Katja Rembold (Postdoc); Arne Wenzel, Lukas Beeretz, Miki Nomura (Master students)

**PROGRESS / CURRENT STATUS**

- Plant survey in Bukit Duabelas landscape completed
- Currently: plant survey in Harapan landscape (ongoing)
- 70% of all core plots finished
- 4035 herbarium specimen have already been sent to Bogor (BIOTROP herbarium) for identification, labeling, and preparation on herbarium paper (ongoing)
- New internship-ERASMUS-project: *Canopy openness and light intensity in different forest transformation systems in Sumatra (Indonesia)* by Miki Nomura (UGoe), field work 24.02.-21.04.2014 (in cooperation with B04, B05, Z01)
- New Master project: *Distribution of invasive*

- alien plant species and their recommendation for management action at Bukit Duabelas, Jambi, Sumatra* by Indah Wahyuni (IPB), beginning depends on funding availability
- New Master project: *Diversity of vascular epiphytes in lowland rainforests and jungle rubber agroforestry systems in Sumatra (Indonesia)* by Arne Wenzel (UGoe), beginning of field work in July 2014
- New Master project: *Diversity of vascular epiphytes along a disturbance gradient in lowland rainforests of Sumatra (Indonesia)* by Lukas Beeretz (UGoe), beginning of field work in July 2014
- Approx. 4900 herbarium specimen from 1752 plant species and morphospecies were collected for identification and deposition in different herbaria (about 1/4 is currently identified to species level)
- All trees within 22 core plots are measured (structure and position), and preliminary identified to morphospecies
- All plants within all subplots in 22 core plots are counted, measured (height), and identified to morphospecies
- About 60,000 (standardized) plant pictures have been taken for online identification

guide / field guides

- Light- and canopy openness measurements (PAR and hemispherical photographs) at all subplots and litter traps from 16 core plots at Harapan landscape completed
- Master thesis entitled *Diversity of vascular epiphytes in lowland rainforest and oil palm plantations in Sumatra (Indonesia)* submitted 02.12.2013 by Christian Altenhövel
- Master thesis entitled *Diversity and dynamics of vascular epiphytes and arthropods in oil palm plantations in Sumatra (Indonesia)* submitted 14.02.2013 by Judith Krobbach



Forest

B07



**TITLE: Functional diversity of mycorrhizal fungi along a tropical land-use gradient**

**TEAM:** Principle Investigators: Andrea Polle (UGoe); Sri Wilarso Budi (IPB); Bambang Irawan, Upik Yelianti (UNJA); Henry Barus, Efi Toding (UN-TAD)  
 Scientific staff: Edy Nur, Josephine Sahner (PhD students)

**PROGRESS / CURRENT STATUS**

- Sampling of all 32 core plots for WP1 completed
- Export permit has been issued
- Processing of samples from reference sites (DNA-extractions, Sanger sequencing, plant DNA barcoding, spore analysis, nutrient analysis etc.)
- DNA amplification of samples for Pyrosequencing

B08

**TITLE: Structure and functioning of the decomposer system in lowland rainforest transformation systems**

**TEAM:** Principle Investigators: Stefan Scheu, Mark Maraun (UGoe); Rahayu Widyastuti (IPB); Wilyus Wilyus (UNJA)  
 Scientific staff: Bernhard Klarner, Valentyna Krashevskaya (Postdocs)

**PROGRESS / CURRENT STATUS**

- WP1:
    - Sampling of all 32 plots - done
    - Sample export –pending
  - WP2: *Ant exclusion experiment*
    - Started in March 2014, in collaboration with B09
    - 1st sampling date –September 2014
  - WP3 *Litter exchange experiment*
    - Started in October / November 2013
    - 1st sampling –performed in March/April 2014
    - Decomposition rate of litter –measured
    - Export of samples for further analysis –pending.
- Collaboration:**
- B09: *Ant Exclusion experiment* –started
  - A01: Palaeoenvironmental changes in Bukit Duabelas peatland during last 7000 years inferred from testate amoebae community composition –analyzed.



Litterbag experiments

- IPB Bogor: Mesofauna identification course – performed
- CRC-ABS proposals granted to:
  - Dr. Rahayu Widyastuti: *Seasonal changes of soil microarthropod populations in microhabitats of oil palm plantations of Southern Sumatra*
  - Dr. Wilyus: *Potential of entomopathogenic fungi in rainforest transformation systems in Jambi province*

B09



**TITLE: Aboveground patterns of biodiversity and associated ecosystem processes across tropical rainforest transformations**

**TEAM:** Principle Investigators: Teja Tschardtke, Yann Clough (UGoe); Damayanti Buchori, Akhmad Rizale (IPB); Fuad Nurdiansyah (UNJA)

Scientific staff: Kevin Darras, Lisa Denmead (PhD students)

**PROGRESS / CURRENT STATUS**

- Bird market survey finished, citizen survey about use of birds ongoing
- Identification of birds in Berbak National Park recordings ongoing
- Ant sampling in core plots is finished, identification ongoing
- Plant, herbivore, predator and ant samples for isotope analysis need to be transported to Göttingen
- Large scale exclusion ant and bird exclusion experiment has been running for 8 months
- Small scale ant exclusion experiment in core plots was started in February 2014

**Highlights/Developments:**

- Bird diversity declines along transformation gradient
- Large scale ant and bird exclusion experiment in oil palm shows marked impact of birds and ants on yield

B10



**TITLE: Landscape-level assessment of ecological and socio-economic functions of rainforest transformation systems**

**TEAM:** Principle Investigators: Kerstin Wiegand, Katrin Meyer, Jann Lay (UGoe); Surya Tarigan Alinda Zain, Ernan Rustiadi (IPB); Sunarti (UNJA)

Scientific staff: Claudia Dislich (Postdoc); Elisabeth Hettig, Fuad Nurdiansyah (PhD students)

**PROGRESS / CURRENT STATUS**

Work towards a coupled ecological-socio-economic simulation model:

- Conceptualization of agent-based household model: We apply a Leontief production function which incorporates costs for



agricultural production divided into the factors labor, capital, land and technical inputs. A first decision criterion of households regarding land-use change and factor input will be based on prospective economic profitability

of land-use options. Data from household survey (C07) are used to derive model parameters (first concept finished, implementation in progress)

- Development of landscape generator that produces artificial land-use maps and land-ownership maps. The simulated landscapes are dominated by small-holder land use as well as large-scale monoculture plantations. The outcomes of this landscape generator will be used as input for the dynamic ecological-economic model (work in progress)
- Analyzing the socio-economic drivers of land-use change in Sulawesi, Indonesia. Long term panel household data from 2001-2013 is used to estimate the micro level determinants of households' land-use patterns and welfare implications of land uses. The relevant determinants are derived from microeconomic theory (work in progress)

- Review of ecosystem functions in oil palm plantations: based on an extensive literature search we review regulating, habitat, production and information functions of oil palm plantations (ongoing work).
- Manuscript on hydrological functions in oil palm plantations (Tarigan et al. close to submission)
- Two CRC-ABS grants:
  - Sunarti: *The distribution of soil organic carbon and its relevance for soil water content in oil palm plantations*
  - Surya Tarigan: *Impact of various soil and water conservation practices on river discharge in oil palm dominated catchments*

## B12

**TITLE: Reproductive strategies of flowering plants in tropical rainforest transformation systems**

**TEAM:** Principle Investigators: Elvira Hörandl (UGoe); Sri Sudarmiyati Tjitrosoedirdjo (IPB and South East Regional Centre for Tropical Biology – BIOTROP), Sri Rahayu (Lembaga Ilmu Pengetahuan Indonesia – LIPI)  
**Scientific staff:** Ladislav Hodac (Postdoc); Nicole Opfermann (PhD student); Fuad Bahrul Ulum (Master student)



**PROGRESS / CURRENT STATUS**

- Pollen exclusion experiment and sampling in all transformation systems (Harapan, Bukit Duabelas) is completed – *Clidemia hirta* (invasive shrub) could be sampled in almost all of the investigated plots
- Forest plots (Harapan, Bukit Duabelas) were checked for presence /absence of the investigated species – *Clidemia hirta* not found in Harapan forest plots
- Population genetic studies molecular progeny arrays (in progress)
- Microscopic histological investigation and flow cytometric seed screening (not started yet)

## HIGHLIGHTS GROUP C

- \* In both regions cultural identity is crucial for access to natural resources. The interaction between cultural and social groups is closely related to land use and land use transformation. The interaction between cultural groups is partly different in both research areas, inter group relations vary in time and structure.
- \* Landscape transformation in Jambi Province is driven by actor groups regarded as external to local population on the village level. Large scale development interventions like the transmigration programs and the global demand for cash crops, such as rubber and palm oil are seen as the main causes for a rapid transformation. On the micro-level, ethnicity, patron-client linkages and kinship are crucial factors mediating access to land and environmental entitlements and therefore shaping rural livelihood systems.
- \* Currently, about 36% of farm households in the study area are found cultivating oil palm and 82% cultivating rubber. Food crop production (e.g., rice, vegetables) is carried out only at a marginal scale. Oil palm expansion, especially among the independent smallholders, is gaining momentum in recent years. The first smallholders to cultivate oil palm were associated with the transmigrant program, while non-assisted migrants and local population adopted oil palm after a time lag.
- \* Contract farming impacted positively on village wealth (measured in terms of assets, such as cars, trucks, TV, satellite dishes, mobile phones, fridges).
- \* Palm oil production creates negative externalities, e.g., through intensive fertilizer application.
- \* Factors significantly affecting decision of traders' marketing channel choice are location, credit access, information access, profitability aspect, and traders' characteristics. A location far from the factory, a low quantity to sell and bad information access make traders rather sell to other channels instead of factories.

## Group C

## C01

**TITLE: Smallholder productivity, market access, and international linkages in rubber and palm oil production in Jambi Province**

**TEAM: Principle Investigators:** Bernhard Brümmer (UGoe); Rina Oktaviani, Dedi Budiman Hakim (IPB); Zulkifli Alamsyah, Raja Sarah Patricia (UNJA); Sudarmiyati Tjitrosoedirdjo (Biotrop)  
**Scientific staff:** Anna Mareike Holtkamp, Thomas Kopp (PhD students)

## PROGRESS / CURRENT STATUS

- WP1 (Mareike Holtkamp)
- Additional smallholder survey of 208 farmer of the household surveyed farmers
    - collection of plant abundance data as well as identification of most of the species in a 5x5m square
    - soil samples on the main plot
  - Linkage of the economic data to our biodiversity data.

Village trader (rubber)



- Currently the first paper is in construction focusing on the technical efficiency of the smallholders.

## Preliminary selected results

- Age-varying functions show strong sensibility to input use especially in the years segment 5–10 towards fertilizer and labor
- Slightly negative correlation between log(revenue) and Biodiversity index of -0.6403 for oil palm plantations
- High variance of biodiversity index on plantation with equal revenue

## WP2 (Tom Kopp)

- Rubber processors have monopsonistic market power
- The existence of Intertemporal Marketing Margin Manipulation could be proved



- Factors significantly affecting decision of traders' marketing channel choice are location, credit access, information access, profitability aspect, and traders' characteristics. A location far from the factory, a low quantity to sell and bad information access make traders rather sell to other channels instead of factories.
- Free trade agreements have a larger impact on the Malaysian palm oil trade than on the Indonesian palm oil trade.

#### Publications

- T. Kopp., Z. Alamsyah, R. S. Patricia, and B. Brümmer. (2014). Have Indonesian Rubber Processors Formed a Cartel? Analysis of Intertemporal Marketing Margin Manipulation. Discussion Paper No. 3/2014, Göttingen: GOEDOC, Dokumenten- und Publikationsserver der Georg-August-Universität. <http://webdoc.sub.gwdg.de/pub/mon/sfb990/dp-3.pdf>. 03/04/2014.

C02



#### TITLE: **Historical and Current Patterns of Cultural Landscape Transformation in Jambi Province**

**TEAM:** Principle Investigators: Heiko Faust, Christoph Dittrich (UGoe); Endriatmo Soetarto, Soeryo Adiwibowo (IPB); Rosyani (UNJA)  
**Scientific staff:** Yvonne Kunz, Rina Mardiana, Barbara Beckert, Jonas Hein (PhD students), Jennifer Merten (M. Sc. student)  
**Associated:** Lutfi Izhar (Ministry of Forestry)

#### PROGRESS / CURRENT STATUS

- Field work has been completed: Qualitative research methods were used and applied to the political ecology perspective on human-environmental interactions.
- Data was also generated by reviewing literature and archives, applying village and household case studies, as well as stakeholder interviews with semi-structured survey techniques, focus group discussions and PRA-tools.
- Interviews have been transcribed and are currently analyzed using qualitative content analysis

#### Preliminary selected results

- Conflicts over land access and control within Hutan Harapan are rather initiated by historical inequalities caused by the non-recognition of community rights within state forest than by the project intervention itself
- Yet the Harapan case shows that marginalized smallholders are able to establish strong actor coalitions within networks or "webs of power" (Ribot and Peluso, 2003, p.156).
- Landscape transformation in Jambi Province is driven by actor groups regarded as external to local population on the village level. Large scale development interventions like the transmigration programs and the global demand for cash crops, such as rubber and palm oil are seen as the main causes for a rapid transformation
- On the micro-level, ethnicity, patron-client linkages and kinship are crucial factors mediating access to land and environmental entitlements and therefore shaping rural livelihood systems.
- The impact of recent forest conservation based mitigation policies such as REDD+ on the cultural landscape remains very limited.

#### Publications

- Faust, H. et al. (2013): Assessment of socio-economic functions of tropical lowland transformation systems in Indonesia: Sampling framework and methodological ap-

proach. EForTS discussion paper series No. 1. Göttingen

- Hein, J. (2013): Reducing emissions from deforestation and forest degradation (REDD+), transnational conservation and access to land in Jambi, Indonesia. EForTS Discussion Paper Series No. 2
- Hein, J., Faust, H. (2014): Conservation, REDD+ and the struggle for land in Jambi, Indonesia. *Pacific Geographies* 41, 20–25
- Mardiana, Rina (2014): Impact of forest and agrarian concession policies in the decentralization era on land use change, agrarian conflict, and agrarian sovereignty struggles. Working Paper, The Asia Foundation.

### C03

**TITLE: Cultural diversity and culture-specific interactions with tropical lowland rainforests in transformation**

**TEAM: Principle Investigators:** Brigitta Hauser-Schäublin (UGoe); Rosyani, Eko Setianto, Ningsih Susanti (UNJA)  
**Scientific staff:** Stefanie Steinebach (Postdoc)

#### PROGRESS / CURRENT STATUS

- 2nd period of fieldwork in the Bukit Duabelas region conducted (November 2013 – February 2014) in close cooperation with counterpart and Indonesian students

#### Preliminary selected results

- The Harapan and Bukit Duabelas landscape are culturally very heterogeneous and population dynamics are different. The composition of cultural groups varies in number and origin. In the Harapan region more spontaneous migrants can be recorded than in the Bukit Duabelas area. In the Bukit Duabelas area a higher number of autochthonous villages with autochthonous population can be found.
- In both regions cultural identity is crucial for access to natural resources. The interaction between cultural and social groups is closely related to land use and land use transformation. The interaction between cultural groups is partly different in both research areas, inter group relations vary in time and structure.

#### Publications

- Hauser-Schäublin, B. (ed.) (2013) *Adat and Indigeneity in Indonesia*. Göttingen, Cultural Property, Volume 7
- Steinebach, S. (2013) *Today we occupy the plantation – Tomorrow Jakarta – Indigeneity, Land and Oil Palm Plantations in Jambi*. In: Hauser-Schäublin, B.: *Adat and Indigeneity in Indonesia*, pp: 63–81, Göttingen: Universitätsverlag Göttingen.
- Brigitta Hauser-Schäublin, Stefanie Steinebach (2014): Harapan: A *No man's land* turned into a contested agro-industrial

zone. EForTS Discussion Paper Series No. 4 Göttingen.



Interview with "Adat-leaders" in 2013

### C04

**TITLE: Long-Term Land Use, Poverty Dynamics and Emission Trade-Offs in Indonesia**

**TEAM: Principle Investigators:** Jann Lay, Stephan Klasen (UGoe); Nunung Nuryartono (IPB); Marhawati Mappatoba (UNTAD)  
**Scientific staff:** Katharina Trapp, Rivayani Darmawan, Dewi Nur Asih, Mohammad Iqbal Irfany (PhD students)

#### PROGRESS / CURRENT STATUS

- Data cleaning of household and village survey are completed
- Setting up panel data structure is in progress



### Preliminary selected results

- Cash crop monocultures—such as open sun cocoa plantations—provide high income opportunities but at the same time, these gains could be offset by longer term production risks related to poor ecological sustainability. Sustainable agroforestry systems could hence dissolve the alleged tradeoff between income generation and environmental sustainability.
- The analysis of the 2007 household's expenditure data in Central Sulawesi reveals that fuel-light consumption and other energy expenditures are the major contributors to household emission. These results are consistent with our findings of the SUSENAS data analysis. A recently available 2013 panel household and agricultural data will allow us to examine the dynamics of household carbon footprints from both consumption and production side.
- Many people in rural Sulawesi are engaged on agricultural activities for their livelihood that any irregularities patterns of climate and weather may threaten the small farmer's crop production, income, and human capital investment. These shocks could then affect food security and poverty of the vulnerable households. Thus, we study the pattern of climate shocks and their implication on rural household's welfare.



left: First day going to the field for data collection; right: Letting go enumerators to Lawe, the most remote village in C04 survey area

### Publications

- Klasen, Stephan, Jan Priebe, and Robert Rudolf (2013). Cash Crop Choice and Income Dynamics in Rural Areas: Evidence for Post-Crisis Indonesia. *Agricultural Economics* 44, no.3: 349–64.

## C06

**TITLE:** Farm-level optimization of land use systems in Indonesia under consideration of uncertainty and ecological effects

**TEAM:** Principle Investigators: Oliver Mußhoff (UGoE); Yusman Syaukat (IPB); Napitupulu Dompok (UNJA)  
Scientific staff: Stefan Moser (PhD student)

### PROGRESS / CURRENT STATUS

- The working progress since October 2013 mainly consists in developing our first pa-

per, which will be finished soon. The title of this paper is *Rewards or punishments with different probabilities in policy measures: A framed field experiment about the effectiveness of incentives in palm oil production*.

### Preliminary selected results (highlights)

- Palm oil production creates negative externalities, e.g., through intensive fertilizer application. If policy wants to limit externalities, an effective and efficient measure seems desirable. Embedded in a framed field experiment in Indonesia, a business simulation game tests several incentives for reducing the use of fertilizer in palm oil production. These incentives are arranged in the form of different designs, i.e., either a reward or punishment, varying in their magnitude and probability of occurrence but constant in the effect on expected income.
- Results show that participants react significantly different depending on the incentive design. A high reward with a low probability to occur was found to be the most effective and sustainable incentive design. For efficiency, a low and certain reward is indicated to be the best design.

## C07

**TITLE: Determinants of land use change and impact on household welfare among smallholder farmers**

**TEAM:** Principle Investigators: Matin Qaim, Stefan Schwarze (UGoe); Hermanto Siregar (IPB); Zaki Fathoni (UNJA)  
 Scientific staff: Vijesh Krishna (Postdoc); Michael Euler (PhD student)

**PROGRESS / CURRENT STATUS**

- Data analysis for WP1 (economic profitability of different transformation systems) has been finalized.
- An MSc thesis, titled as *Farm Profitability and Resource Use in Rubber and Oil Palm Production in Batanghari, Jambi, Indonesia* (by Triana Gita Dewi) based on WP1 is completed.
- An MSc thesis, titled as *Determinants of Household Food Security: A Comparative Analysis of Eastern and Outside Eastern Indonesia* (by Puspi Eko Wiranthi) covering aspects of WP3 is completed.
- Preliminary results with respect to WP2 (determinants of recent land use changes) are available. A duration model has been estimated to identify factors influencing the time spell from exposure until adoption of oil palm by smallholders.

- Associated with B09 to conduct a bird market survey in Jambi city. Preliminary results from this survey are available.

**Preliminary selected results**

- Currently, about 36% of farm households in the study area are found cultivating oil palm and 82% cultivating rubber. Food crop production (e.g., rice, vegetables) is carried out only at a marginal scale.
- Oil palm expansion, especially among the independent smallholders, is gaining momentum in recent years.
- The first smallholders to cultivate oil palm were associated with the transmigrant program, while non-assisted migrants and local population adopted oil palm after a time lag.
- Adoption of oil palm increases, if farmers reside in geographical proximity of large scale oil palm plantations and processing mills. On the household level education, market access, in-migration, participation in the land market and affiliation to supported migration programs are found to increase adoption.
- Although rubber plots are rarely converted into oil palm, both crops are competing for fallow and degraded forest lands for expansion.



Compared to the previous decades, the smallholder plantations are developed less frequently through deforestation and land acquisition through market is frequently observed in recent years. However, the evolving and active land markets are found having no significant effect on the rate of deforestation. In the absence of de jure recognition of land ownership, the parcels are highly undervalued in the market, preventing the emergence of speculative market conditions that enhance deforestation.

## C08

**TITLE: Collective decision making and land allocation at the village level**

**TEAM:** Principle Investigators: Meike Wollni, Marcela Ibanez (UGoe); Bambang Juanda (IPB); Rosyani (UNJA)  
**Scientific staff:** Marcel Gatto, Miriam Vorlaufer (PhD students)

**PROGRESS / CURRENT STATUS**

WP 1: Village level determinants of land allocation (Marcel Gatto)

1. Writing paper on land use change:

- Between 2002–2012 increasing importance of oil palm monoculture
- In 2012 (jungle) rubber still dominant land-use system
- Mainly (jungle) rubber and sleeping land conversion associated with oil palm expansion between 2002–2012
- Transmigration Program pervasive impact on land-use change; other prominent drivers found less relevant

2. Analyzing data on contract adoption and impact of contracts on village development

- Inclusion of villages in the oil palm development fairly equal
- Contract Farming positive impact on vil-

lage wealth (measured in terms of assets, such as cars, trucks, TV, satellite dishes, mobile phones, fridges)

WP2: Design of incentive mechanisms for sustainable land use (Miriam Vorlaufer)  
 Working progress since October 2013 and preliminary selected results:

- In the first paper, we investigate the trade-off between equity considerations and conservation outcome of alternative Payments for Environmental Services (PES) schemes, using the results of a public good experiment. Between November 2012 and February 2013, we conducted a public good experiment in two transmigrant and two autochthonous villages in Batanghari district. Particularly, we investigate the impact of two alternative PES scheme, that implicitly incorporate different fairness principles on conservation and equity considerations under endowment and productivity heterogeneity of the game subjects. We test an equal PES scheme, where a fixed flat rate per ha is paid and an unequal PES scheme, where low-endowed subjects receive a higher compensation per ha than high-endowed subjects due to varying opportunity costs of conservation.



Results indicate that:

- While the introduction of an unequal PES significantly reduces the inequality (gini coefficient) among group members, the implementation of an equal PES scheme does not significantly affect the income distribution.
- The introduction of unequal PES (compared to equal PES) does not necessarily need to be compromised by lower conservation area at community level.
- A person's relative position in a group determines what is perceived as fair; while the introduction of an unequal PES scheme crowds-in the intrinsic motivation to conserve of low-endowed subjects, it crowds-out conservation behavior of high-endowed subjects.

## HIGHLIGHTS GROUP Z02

- \* Both the meteo stations in the plots and the reference meteo stations in the 4 reference sites are running. Data from meteo stations in the plots until November/December 2013 already available.
- \* Sampling for DNA barcoding of vascular plants and canopy arthropods is completed. Of the canopy arthropods ~315.000 specimen have successfully been assigned to 30 arthropod orders.

## Z02 Central Scientific Support Unit (CSSU)

TITLE: **Meteo stations**

**TEAM:** Principle Investigators: Alexander Knohl, Oleg Panferov (UGoe); Tania June (IPB); Abdul Rauf, Irianto, Heri Junedi (UNJA); Dodo Gunawan (BMKG)  
**Scientific staff:** Ana Meijide, Merja Tölle, Mathias Herbst (Postdocs)

## PROGRESS / CURRENT STATUS

- Meteo stations in plots running with small data gaps in all plots because of technical problems but in general good data coverage.
- Reference meteo stations running in 4 reference sites
- Station in UNJA not running. There was a fire next to the building at UNJA in February, affecting the demonstration meteorological stations. Only some cables were burnt and they have been repaired. A stone path has been built around the stations to avoid future fires to get close to the equipment.
- Data from meteo stations in the plots until November/December 2013 already available. Later data and those from reference meteorological stations will be uploaded in the coming weeks.
- Meteo station in HR1 was stolen, it has already been replaced.

TITLE: **DNA barcoding of vascular plants**

**TEAM:** Principle Investigators: Reiner Finkeldey (UGoe); Iskandar Z. Siregar, Ulfaj J Siregar, Utut Widyastuti (IPB); Hamzah (UNTAD); Sri Rahayu (LIPI)  
**Scientific staff:** Fitri Yola Amandita (PhD student)

## PROGRESS / CURRENT STATUS

- The sample collection in all core plots in Bukit Duabelas National Park has been completed
- The sample collection in Harapan Forest is still ongoing
- In total, 22 plots have been sampled from which 3.800 leaf samples has been collected



Reference meteorological station at PT REKI



DNA barcoding

## Z02 Central Scientific Support Unit (CSSU)

**TITLE: Monitoring aboveground animal biodiversity: canopy arthropods**

**TEAM:** Principle Investigators: Stefan Scheu (UGoe); Damayanti Buchori, Iskandar Z Siregar (IPB); Bambang Irawan (UNJA); Rosikhon Ubaidillah (LIPI)  
Scientific staff: Jochen Drescher (Postdoc)



Fogging of trees

### PROGRESS / CURRENT STATUS

Samples have been taken from all 32 CRC research plots (plus some extra plots in PT REKI) in both dry season 2013 and rainy season 2013/2014

- Arthropod identification to order level has been completed for the dry season samples

of 28/32 CRC research plots (TNBD sample identification still in progress)

- So far, ~315.000 specimen have successfully been assigned to 30 arthropod orders

### HIGHLIGHTS INF PROJECT

- \* Several datasets, including meteo / yield data and plot diaries are available on EForTS-IS. The Data Exchange Agreement has been signed by all parties.

### Data Management and Data Sharing (INF Project)

**TEAM:** Principle Investigators: Winfried Kurth, Joachim Saborowski, Heike Neuroth, Fabian Cremer, Thomas Fischer, Tim Ritter (UGoe); Heru Sukoco (IPB); Zakky Fathoni (UNJA); Golar Baso (UNTAD); Laksana Tri Handoko, Sandra Yuwana (LIPI)

### PROGRESS / CURRENT STATUS

- The information system EForTS -IS entered productive phase
- Several datasets available, including meteo- and yield data
- Data Exchange Agreement signed
- Plot Diaries ingested, improved version released
- Started sub project visits and individual data management plans





## 2. Biodiversity research, access to genetic resources and benefit sharing (ABS)

### Background

The approval of the Convention on Biological Diversity (CBD) in 1992 was the first step of a new approach to the biodiversity resources and their use, which includes the national sovereignty principle, mutually agreed term and sharing benefits of the use of biodiversity. The *Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity, (ABS)* was signed by both Germany and the EU on 23 June 2011, and by the Republic of Indonesia on 8 May 2013 (Law No 11 / 2013).

This new approach is a legal but also a moral commitment which the DFG includes in its institutional policies. For that reason, DFG follows the international regime on ABS and tries to build a bridge between that regime and the scientific community (compare with [http://www.dfg.de/formulare/1\\_021/1\\_021.pdf](http://www.dfg.de/formulare/1_021/1_021.pdf)).

For the CRC 990 – EFForTS, DFG approved funding of ABS measures with central research funds (“Pauschale Mittel”). Since November 2013 EFForTS provides short-term research grants to counterparts and stakeholders (LIPI, PHKA, BMKG, PTPN VI, PT HUMUSINDO and PT REKI) to strengthen the research cooperation and to complement existing research activities addressing new scientific questions.

So far 24 (+2 to come) research projects have been accepted for funding.

## RESEARCH PROJECTS OF COUNTERPARTS



Research projects of counterparts funded at IPB

Name	Affiliation	Counter-part	Title
<b>Dr. Herdhata Agusta</b>	IPB	A02	Soil water dynamics in oil palm and rubber plantations in relation to slope and vegetation cover
<b>Dr. Murti Laksono</b>	IPB	A04	Dissolved organic carbon in the Bukit Duabelas National Park and the relationship with the soil properties and its toposequences
<b>Dr. Noor Haneda</b>	IPB	B01	The soil animal diversity and its role in litter decomposition rate and nutrient cycle in various types of ecosystems in Jambi
<b>Dr. Nisa Mubarik</b>	IPB	B02	Biodiversity inventory, collection and preservation (in-situ and ex situ): prokaryotes and leaf blight pathogenic fungi on oil palm
<b>Dr. Ulfah Siregar</b>	IPB	B03	Development of DNA barcode for two indigenous <i>Dyera</i> species in Jambi
<b>Dr. Sri Wilarso Budi</b>	IPB	B07	Diversity of arbuscular mycorrhizal fungi in Bukit Duabelas and Harapan Forest, Jambi Province
<b>Dr. Rahayu Widyastuti</b>	IPB	B08	Seasonal changes of soil microarthropod populations in microhabitats of oil palm plantations of Southern Sumatra
<b>Dr. Damayanti Buchori</b>	IPB	B09	Ecological Services of transformed ecosystems: the role of ants in different land-use in Jambi
<b>Dr. Suria Tarigan</b>	IPB	B10	Landscape-level assessment of ecological and socio-economic functions of rainforest transformation systems in Sumatra (Indonesia)
<b>Prof. Ervizar Zuhud</b>	IPB	C03	Ethnobotany of <i>Jelutung</i> ( <i>Dyera</i> spp) in Suku Anak Dalam, Jambi



<b>Dr. Nunung Nuryartono</b>	IPB	C04	Poverty and consumption pattern in Jambi and Central Sulawesi Province
<b>Prof. Damayanti Buchori</b>	IPB	Z02	Population structure of the invasive Yellow Crazy Ant <i>Anoplolepis gracilipes</i> across land-use systems in Jambi, Sumatra, Indonesia



Research projects of counterparts funded at UNJA

<b>Dr. Asmadi Saad</b>	UNJA	A01	Tropical modern pollen collection as a tool to interpret the quarternary fossil pollen records in Sumatra, Indonesia
<b>Prof. Muhammad Damris</b>	UNJA	A04	UV and FTIR characterization of dissolved organic carbon in soil extracts and leachates from tropical lowland rainforest transformation systems
<b>Dr. Bambang Irawan</b>	UNJA	B03	Flowering and fruiting ecology of ironwood ( <i>Eusideroxylon zwageri</i> Teijsm. & Binn.)
<b>Dr. Revis Asra</b>	UNJA	B06	Diversity of Dragon's Blood Palm ( <i>Daemonorops</i> spp) in Bukit Duabelas National Park, Sumatra, Indonesia
<b>Dr. Wilyus</b>	UNJA	B08	Potential of entomopathogenic fungi in rainforest transformation systems in Jambi province
<b>Dr. Sunarti</b>	UNJA	B10	The distribution of soil organic carbon and its relevance for soil water content in oil palm plantations
<b>Dr. Rosyani</b>	UNJA	C03	SAD Community institutional development and its impact on environmental changes around the National Park Bukit Duabelas



Research projects of counterparts funded at IPB and UNJA

<b>Prof. Nengah Surati Jaya and Mr. M Zuhdi</b>	IPB - UNJA	B05	Spatial pattern of forest and land cover change in Jambi province (Sumatra, Indonesia) from 1990 to 2012
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Research projects of counterparts funded at UNTAD

<b>Dr. Aiyeen Tjoa / Dr. Sri Rahayu Utami</b>	UNTAD - UB	A05	Field decomposition of pruned oil palm frond and its nutrients release pattern
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Research projects of counterparts funded at LIPI

<b>Dr. Sri Rahayu</b>	LIPI	B03/ Z02	Genetic diversity and DANN barcode based identification of <i>Hoya</i> (Apocynaceae: Asclepiadoideae) in different transformation systems in Jambi
<b>Dr. Sri S. Tjitrosoedirdjo</b>	SEAMEO BIOTROP - LIPI	B06	Distribution of invasive alien plant species and their recommendation for management action at Bukit Duabelas, Jambi, Sumatra



Research projects of stakeholders funded at PT REKI

<b>Luce</b>	PT REKI	B04/ B08	Nutrient input and decomposition in high and low quality lowland secondary tropical rain forests
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Research projects of stakeholders funded at the Ministry of Forestry

<b>Dr. Lutfi Izhar</b>	Ministry of Forestry (HTR / BP2HP IV Jambi Region)	C02	Forest Community Plantation as Alternative Conflict Resolution of PT. REKI Concession in Jambi Province
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Research projects of associated PhD students

<b>Fitri Yola Amandita</b>	associated PhD	Z02	DNA barcoding of vascular plants
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## First results

**Dr. Nisa Rachmania Mubarik – IPB – B02:**

*“Diversity of rhizosphere bacteria from tropical rainforest and rainforest transformation in Jambi”*

Oil palm (*Elaeis guineensis* Jacq.) is one of the main plantation commodities in Indonesia. Production of oil palm is influenced by several environmental conditions such as rainfall, soil, climate, and pathogen outbreak. Pathogen outbreak such as anthracnose and leaf blight cause rotting on leaves of oil palm seedling which in the end will kill the plant. Prevention on pathogen outbreaks on oil palm which was caused by pathogenic fungi can be done by using chitinolytic bacteria which can produce chitinase enzyme as biological control. Chitin is one of the elements in cell walls, mycelia, stalks, and spore of the fungi. The aims of these experiments were to

isolate chitinolytic and cellulolytic bacteria and to investigate under *in vitro* test of their potential as biological control of pathogenic fungi on oil palm (Fig. 1). Results showed that two suspected pathogenic fungi were isolated from leaves of oil palm viz *Curvularia* sp. and *Colletotrichum* sp. (Fig. 2). From 28 isolates of chitinolytic bacteria, there were only *Bacillus thuringiensis* SAHA12.08, SAHA12.10, and *Bacillus* sp.SAHA12.13 had antagonistic activity to the growth of *Curvularia* sp. and *Colletotrichum* sp., respectively; whereas strain KAHN15.12 only showed an antagonistic activity to *Colletotrichum* sp. From total of 40 isolates cellulolytic bacteria only *Bacillus cereus* SAHN13.30 and *Bacillus thuringiensis* KAHN15.39 had antagonistic activity to the growth of *Curvularia* sp. and *Colletotrichum* sp., respectively (Fig. 3).

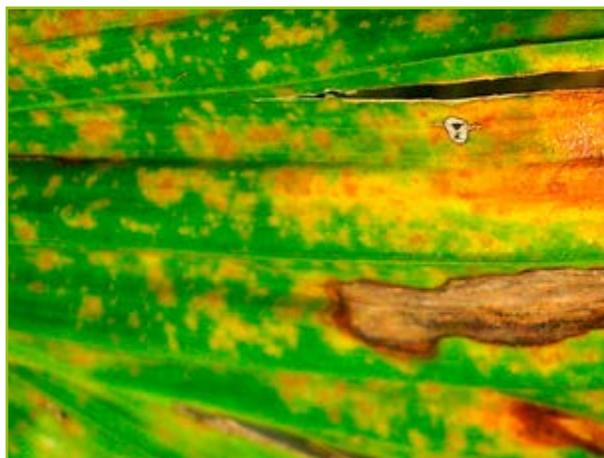


Fig. 1 Symptoms of leaf spot fungi on oil palm

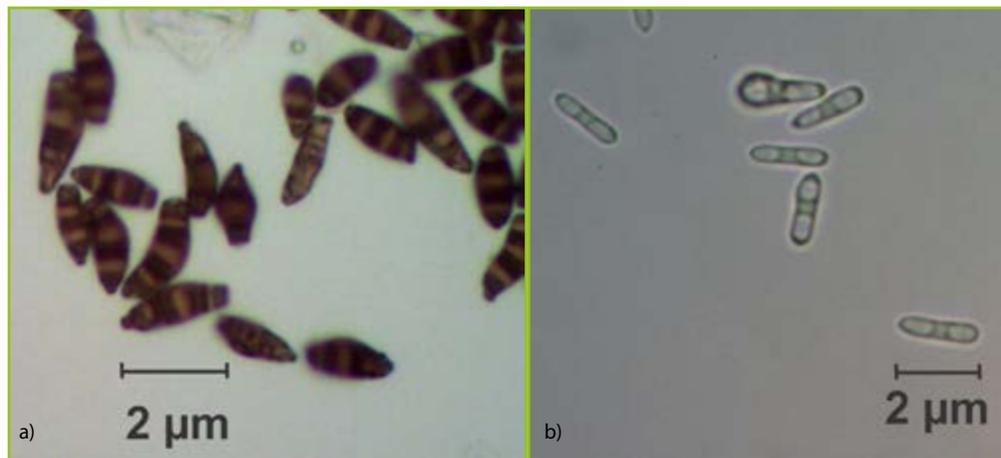


Fig. 2 Cell morphology of pathogenic fungi from oil palm. (a) *Curvularia* sp. (b) *Colletotrichum* sp.

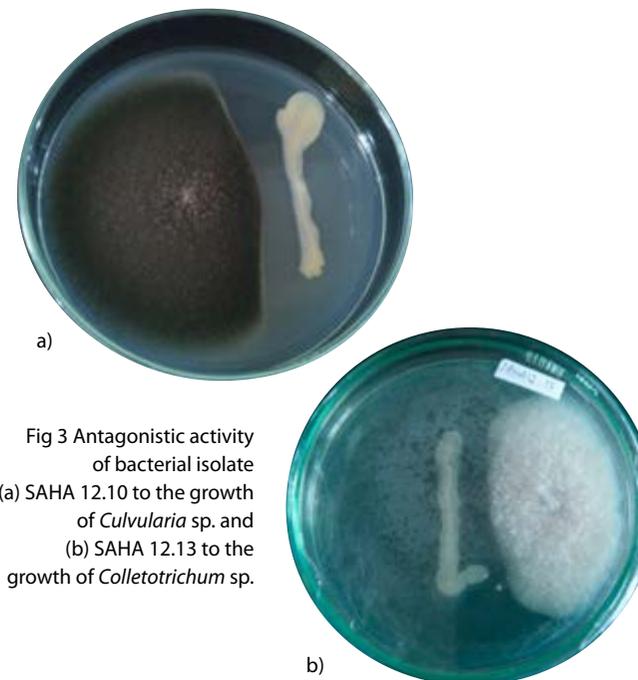


Fig 3 Antagonistic activity of bacterial isolate  
(a) SAHA 12.10 to the growth of *Curvularia* sp. and  
(b) SAHA 12.13 to the growth of *Colletotrichum* sp.



### 3. Master studies of the CRC 990

TP	Name	Theses
B01	<b>Steffen Mumme</b>	Alteration of functional diversity along a land-use gradient in Sumatra, Indonesia <a href="http://www.uni-goettingen.de/de/alteration-of-functional-diversity-along-a-land-use-gradient-in-sumatra-indonesia-steffen-mumme/481352.html">http://www.uni-goettingen.de/de/alteration-of-functional-diversity-along-a-land-use-gradient-in-sumatra-indonesia-steffen-mumme/481352.html</a>
B04	<b>Selis Meriem</b>	Contribution of dead wood to biomass and carbon stocks and its biochemical contents in lowland rainforest transformation systems on Sumatra, Indonesia <a href="http://www.uni-goettingen.de/de/contribution-of-dead-wood-to-biomass-and-carbon-stocks-in-lowland-rainforest-transformation-systems-on-sumatra-indonesia-selis-meriem/481681.html">http://www.uni-goettingen.de/de/contribution-of-dead-wood-to-biomass-and-carbon-stocks-in-lowland-rainforest-transformation-systems-on-sumatra-indonesia-selis-meriem/481681.html</a>
B04	<b>Yuna Pransiska</b>	Vertical root distribution and contribution of coarse roots to the soil carbon pool in lowland rainforest transformation systems on Sumatra, Indonesia <a href="http://www.uni-goettingen.de/de/vertical-root-distribution-and-contribution-of-coarse-roots-to-the-soil-carbon-pool-in-lowland-rainforest-transformation-systems-on-sumatra-indonesia-yuna-pransiska/481683.html">http://www.uni-goettingen.de/de/vertical-root-distribution-and-contribution-of-coarse-roots-to-the-soil-carbon-pool-in-lowland-rainforest-transformation-systems-on-sumatra-indonesia-yuna-pransiska/481683.html</a>
B05	<b>Setia Edwine Purnama</b>	Evaluation of remotely sensed data in determining forest structure and its biomass – case studies from Jambi, Sumatra and Central-Kalimantan <a href="http://www.uni-goettingen.de/de/evaluation-of-remotely-sensed-data-in-determining-forest-structure-and-its-biomass---case-studies-from-jambi-sumatra-and-central-kalimantan-edwine-setia-purnama/481826.html">http://www.uni-goettingen.de/de/evaluation-of-remotely-sensed-data-in-determining-forest-structure-and-its-biomass---case-studies-from-jambi-sumatra-and-central-kalimantan-edwine-setia-purnama/481826.html</a>
B06	<b>Christian Altenhövel</b>	Diversity of vascular epiphytes in lowland rainforests and oil palm plantations in Sumatra (Indonesia) <a href="http://www.uni-goettingen.de/de/diversity-of-vascular-epiphytes-in-lowland-rainforests-and-oil-palm-plantations-in-sumatra-indonesia-christian-altenhoevel/415324.html">http://www.uni-goettingen.de/de/diversity-of-vascular-epiphytes-in-lowland-rainforests-and-oil-palm-plantations-in-sumatra-indonesia-christian-altenhoevel/415324.html</a>
B06	<b>Lukas Beeretz</b>	Diversity of vascular epiphytes along a forest distance gradient Diversity of vascular epiphytes along a disturbance gradient in lowland rainforests of Sumatra, Indonesia <a href="http://www.uni-goettingen.de/de/diversity-of-vascular-epiphytes-along-a-disturbance-gradient-in-lowland-rainforests-of-sumatra-indonesia-lukas-beeretz/481354.html">http://www.uni-goettingen.de/de/diversity-of-vascular-epiphytes-along-a-disturbance-gradient-in-lowland-rainforests-of-sumatra-indonesia-lukas-beeretz/481354.html</a>
B06	<b>Judith Krobbach</b>	Diversity and Dynamics of epiphytes and associated ants in oil palm plantations in Sumatra (Indonesia) <a href="http://www.uni-goettingen.de/de/diversity-and-dynamics-of-epiphytes-and-associated-ants-in-oil-palm-plantations-in-sumatra-indonesia-judith-krobbach/415323.html">http://www.uni-goettingen.de/de/diversity-and-dynamics-of-epiphytes-and-associated-ants-in-oil-palm-plantations-in-sumatra-indonesia-judith-krobbach/415323.html</a>



TP	Name	Theses
B06	<b>Arne Wenzel</b>	Diversity of vascular epiphytes in lowland rainforests and jungle rubber agroforestry systems in Sumatra (Indonesia) <a href="http://www.uni-goettingen.de/de/diversity-of-vascular-epiphytes-in-lowland-rainforests-and-jungle-rubber-agroforestry-systems-in-sumatra-indonesia-arne-wenzel/481355.html">http://www.uni-goettingen.de/de/diversity-of-vascular-epiphytes-in-lowland-rainforests-and-jungle-rubber-agroforestry-systems-in-sumatra-indonesia-arne-wenzel/481355.html</a>
B09	<b>Dominik Ganser</b>	Ecosystem services provided by epiphytic plants in rainforest transformation systems of Sumatra <a href="http://www.uni-goettingen.de/de/ecosystem-services-provided-by-epiphytic-plants-in-rainforest-transformation-systems-of-sumatra-indonesia-dominik-ganser/481430.html">http://www.uni-goettingen.de/de/ecosystem-services-provided-by-epiphytic-plants-in-rainforest-transformation-systems-of-sumatra-indonesia-dominik-ganser/481430.html</a>
B09	<b>Manuel Toledo Hernandez</b>	What are the factors determining the dynamics and ecological functions of homegardens in Southern Jambi Province, Sumatra? <a href="http://www.uni-goettingen.de/de/what-are-the-factors-determining-the-dynamics-and-ecological-functions-of-homegardens-in-southern-jambi-province-sumatra-manuel-toledo-hernandez/481432.html">http://www.uni-goettingen.de/de/what-are-the-factors-determining-the-dynamics-and-ecological-functions-of-homegardens-in-southern-jambi-province-sumatra-manuel-toledo-hernandez/481432.html</a>
B09	<b>Arite Hildebrandt</b>	Dietary and functional analysis of birds in transformation systems of Jambi, Indonesia <a href="http://www.uni-goettingen.de/de/dietary-and-functional-analysis-of-birds-in-transformation-systems-of-jambi-indonesia-arite-hildebrandt/481435.html">http://www.uni-goettingen.de/de/dietary-and-functional-analysis-of-birds-in-transformation-systems-of-jambi-indonesia-arite-hildebrandt/481435.html</a>
B09	<b>Walesa Edho Prabowo</b>	The response of bird communities to different landuse inJambi, South Sumatera, Indonesia <a href="http://www.uni-goettingen.de/de/the-response-of-bird-communities-to-different-landuse-in-jambi-south-sumatera-indonesia-in-jambi-south-sumatera-indonesia-walesa-edho-prabowo/481479.html">http://www.uni-goettingen.de/de/the-response-of-bird-communities-to-different-landuse-in-jambi-south-sumatera-indonesia-in-jambi-south-sumatera-indonesia-walesa-edho-prabowo/481479.html</a>
B10	<b>Martin Bruneß</b>	rough topic: land-use change in Indonesia <a href="http://www.uni-goettingen.de/de/land-use-change-in-indonesia-martin-brune%C3%9F/481466.html">http://www.uni-goettingen.de/de/land-use-change-in-indonesia-martin-brune%C3%9F/481466.html</a>
B11	<b>Robin Naumann</b>	Biodiversity enrichment in oil palm plantations <a href="http://www.uni-goettingen.de/de/biodiversity-enrichment-in-oil-palm-plantations-robin-naumann/481475.html">http://www.uni-goettingen.de/de/biodiversity-enrichment-in-oil-palm-plantations-robin-naumann/481475.html</a>
B12	<b>Fuad Bahrul Ulum</b>	Ploidy levels and reproductive behavior in natural populations of Centotheca lappacea from Jambi, Indonesia <a href="http://www.uni-goettingen.de/de/ploidy-levels-and-reproductive-behaviour-in-natural-populations-of-centotheca-lappacea-from-jambi-indonesia-fuad-bahrul-ulum/481484.html">http://www.uni-goettingen.de/de/ploidy-levels-and-reproductive-behaviour-in-natural-populations-of-centotheca-lappacea-from-jambi-indonesia-fuad-bahrul-ulum/481484.html</a>
C01	<b>Riska Pujiati</b>	The Impact of Free Trade Agreements on Commodity Trade Flows. Case Study: International Palm Oil Trade <a href="http://www.uni-goettingen.de/de/the-impact-of-free-trade-agreements-on-commodity-trade-flows-case-study-international-palm-oil-trade-riska-pujiati/481477.html">http://www.uni-goettingen.de/de/the-impact-of-free-trade-agreements-on-commodity-trade-flows-case-study-international-palm-oil-trade-riska-pujiati/481477.html</a>



TP	Name	Theses
C01	<b>Rakhma Melati Sujarwo</b>	Choice of Marketing Channels by Small Traders: The Case of Rubber Traders in Jambi Province, Indonesia <a href="http://www.uni-goettingen.de/de/choice-of-marketing-channels-by-small-traders-the-case-of-rubber-traders-in-jambi-province-indonesia-rakhma-melati-sujarwo/481481.html">http://www.uni-goettingen.de/de/choice-of-marketing-channels-by-small-traders-the-case-of-rubber-traders-in-jambi-province-indonesia-rakhma-melati-sujarwo/481481.html</a>
C02	<b>Jennifer Merten</b>	Land use change and rural water supply in the tropics. Perceptions and impacts of oil palm expansion in Sumatra, Indonesia <a href="http://www.uni-goettingen.de/de/land-use-change-and-rural-water-supply-in-the-tropics-perceptions-and-impacts-of-oil-palm-expansion-in-sumatra-indonesia-jennifer-merten/481473.html">http://www.uni-goettingen.de/de/land-use-change-and-rural-water-supply-in-the-tropics-perceptions-and-impacts-of-oil-palm-expansion-in-sumatra-indonesia-jennifer-merten/481473.html</a>
C06	<b>Seraphim Freiherr von Loë</b>	The effect of farmer's time preferences on measures to enhance soil organic matter: an experimental approach <a href="http://www.uni-goettingen.de/de/the-effect-of-farmers-time-preferences-on-measures-to-enhance-soil-organic-matter-an-experimental-approach-seraphim-freiherr-von-lo%C3%AB/481471.html">http://www.uni-goettingen.de/de/the-effect-of-farmers-time-preferences-on-measures-to-enhance-soil-organic-matter-an-experimental-approach-seraphim-freiherr-von-lo%C3%AB/481471.html</a>
C06	<b>Dörte Rüther</b>	An experimental investigation of farmer's time preferences – a method comparison <a href="http://www.uni-goettingen.de/de/an-experimental-investigation-of-farmer%C2%B4s-time-preferences---a-method-comparison-doerte-r%C3%BCther/481480.html">http://www.uni-goettingen.de/de/an-experimental-investigation-of-farmer%C2%B4s-time-preferences---a-method-comparison-doerte-r%C3%BCther/481480.html</a>
C07	<b>Triana Gita Dewi</b>	Farm profitability and resource use in rubber and oil palm smallholders of Batanghari, Jambi, Indonesia <a href="http://www.uni-goettingen.de/de/farm-profitability-and-resource-use-in-rubber-and-oil-palm-smallholders-of-batanghari-jambi-indonesia-dewi-triana-gita/481678.html">http://www.uni-goettingen.de/de/farm-profitability-and-resource-use-in-rubber-and-oil-palm-smallholders-of-batanghari-jambi-indonesia-dewi-triana-gita/481678.html</a>
C07	<b>Puspi Eko Wiranthi</b>	Determinants of Household Food Security: A Comparative Analysis of Eastern and Outside Eastern Indonesia <a href="http://www.uni-goettingen.de/de/determinants-of-household-food-security-a-comparative-analysis-of-eastern-and-outside-eastern-indonesia-puspi-eko-wiranthi/482768.html">http://www.uni-goettingen.de/de/determinants-of-household-food-security-a-comparative-analysis-of-eastern-and-outside-eastern-indonesia-puspi-eko-wiranthi/482768.html</a>
C08	<b>Thomas Fagan</b>	Is there a link between poverty and the propensity to spend windfall gains? An analysis of rural households' purchasing patterns in Indonesia. <a href="http://www.uni-goettingen.de/de/is-there-a-link-between-poverty-and-the-propensity-to-spend-windfall-gains-an-analysis-of-rural-households-purchasing-patterns-in-indonesia-thomas-fagan/481468.html">http://www.uni-goettingen.de/de/is-there-a-link-between-poverty-and-the-propensity-to-spend-windfall-gains-an-analysis-of-rural-households-purchasing-patterns-in-indonesia-thomas-fagan/481468.html</a>
C08	<b>Sandra Tappendorf</b>	Determinants of Trust Preferences in Rural Sumatra <a href="http://www.uni-goettingen.de/de/determinants-of-trust-preferences-in-rural-sumatra-sandra-tappendorf/481482.html">http://www.uni-goettingen.de/de/determinants-of-trust-preferences-in-rural-sumatra-sandra-tappendorf/481482.html</a>



#### 4. Counterpart meetings - group meetings

##### Counterpart meeting at IPB



The first meeting of the counterparts from IPB was held at IPB, Bogor, Indonesia, on January 9, 2014. Thirty six counterparts participated in the meeting.

##### THE MAIN RESULTS OF THE MEETING WERE

- Access to data / EForTS-IS: a training workshop will be organized by Surya Tarigan and Wolfram Lorenz
- Administration and management of data / samples that are not covered by the MTA (e.g. non-physical samples or interview data): shall be integrated into the respective counterpart agreements. A new format will be set up
- Central documentation at CRC office Bogor of status quo of export permits and material transfers
- Changes of research activities by the PI shall be communicated with the counterpart for approval
- Counterparts shall be involved in supervision of PhD students from Göttingen
- Graphic documentation of travels of CRC researchers on EForTS-IS

##### Group A meeting (Environmental processes)

The second science meeting of group A was held at the Faculty of Forest Sciences and Forest Ecology of the University of Göttingen, on April 9, 2014. Eleven members – including two counterparts from Indonesia (Asmadi Saad, A01 and Surya Tarigan, group A speaker at IPB) participated. Aiyen Tjoa (A05) joined from Indonesia via Skype.

##### THE MAIN RESULTS OF THE MEETING WERE

1. Overarching topics and respective contributions from subprojects are
  - a. Carbon and nitrogen cycles
    - nitrate leaching: A05
    - DOC: Damris-UNJA-A04
    - labile fraction of SOC: Damris-UNJA-A04
    - C01 soil sampling at 200 households
  - b. Nutrient availability
    - nutrient leaching: A05
    - macro- and micronutrient: Aiyen-UNTAD-A05
    - cation exchange capacity: A05
  - c. Greenhouse gas fluxes
    - Atmosphere: A03
    - epiphyte incubation: A05
    - soil efflux: A05
  - d. Water-use
    - aerodynamic methods & Penman-Monteith & energy partitioning: Tania June-IPB-A03
    - erosion and surface runoff: Augusta-IPB-A02
    - soil water modelling: Syahrul-A05
    - water budget on catchment scale: Surya-IPB-A03

- lysimeter: A04
  - water sources: A02
  - leaching of DOM: A04
  - sap flux: A02
  - ecosystem water fluxes: A03
  - collaboration on water use with C01, C02, C08
- e. Ecosystem-Atmosphere interaction
- surface roughness & albedo & surface temperature: Tania June-IPB-A03
  - land surface modelling: Yuanchoo-A03
  - land surface remote sensing: Clifton-A03 and Ardiansyah
  - vegetation sensitivity to climate: A01
  - hemispheric photos: A02
  - regional scale modelling: Dodo & Akhmed-BMKG-A03
  - prehistoric and historic environment: A01
  - water fluxes across transformation systems: A02

##### 2. Outlook

- The next video science meeting – after the Status workshop in October – will be held in April 2015 with the following modifications
  - Surya, Asmadi and Aiyen organize contributions from the colleagues at IBP, UNJA, UNTAD
  - Indonesian counterparts will give main presentations with contributions from UGoe



## II. Integration of Ecological and Socioeconomic Research

Integration / integrative research activities across disciplines in the CRC is realized through

- the establishment of a joint enrichment planting experiment (B11)
- four thematic foci / overarching joint hypotheses.

### 1. The enrichment experiment

B11



**TITLE: Biodiversity enrichment in oil palm plantations: ecological and socio-economic impacts**

**TEAM:** Principle Investigators: Holger Kreft, Ulrich Brose, Dirk Hoelscher, Yann Clough, Meike Wollni (UGoe); Hendrayanto, Leti Sundawati, Prijanto Pamoengkas (IPB); Bambang Irawan,

Scientific staff: Miriam Teuscher, Anne Gérard (PhD students)

#### PROGRESS / CURRENT STATUS

52 plots of varying size were established in the plantation of PT Humusindo near Bungku village

#### Baseline data collection:

- botanical: understory vegetation survey and canopy density measurement (hemispherical photographs) in 2x2 m subplot, seed traps, now emptied every 2 weeks
- zoological: sampling of insects in understory vegetation (1x1 m, vacuum), in leaf axils of one oil palm next to the plot and in the leaf litter (1x1 m); bird survey (point counts)

- 154 oil palms within the plots were logged, reducing the canopy density by ca. 40%
- 6354 trees belonging to six native species (Durian, Petai, Jelutung, Jengkol, Sungkai, Meranti) were planted in varying diversity levels and species composition per plot following a strict design
- Height and basal diameter of planted trees were measured
- Around 500 trees have died due to heavy rainfalls and flooding in January. Since then, some trees have died due to drought and have all been replaced with new seedlings.

### B11, C08 integrative study

**TITLE: How much is a bird? Bird diversity in smallholder oil palm plantations**



*Prinia sericeus*

**REPRESENTATIVES:** Miriam Teuscher, Miriam Vorlaufer, Yann Clough, Uli Brose, Meike Wollni

#### PROGRESS / CURRENT STATUS

In a pilot study for the B11 project we investigate the effect of natural tree islands in smallholder oil palm plantations on bird diversity and oil palm profitability. For our sampling, we have randomly selected 120 oil palm farmers, who are located in two autochthone and two transmigrant villages in Batanghari district. Subsequent to a household survey, bird diversity and vegetation structure was assessed on each plot. Preliminary findings suggest that:

- The abundance of trees per plot had a significantly positive effect on bird diversity,
- But a significantly negative effect on oil palm revenue.

Preliminary results thus indicate that a trade-off between economic and ecological functions of tree islands in smallholder oil palm plantations exists.



**2. Four thematic foci**

**Focus 1**

**TITLE: Assessment of ecological and socio-economic functions across tropical transformation systems**

**REPRESENTATIVES:** Yann Clough, Oliver Mußhoff & Edzo Veldkamp

Focus 1 is working on a transdisciplinary empirical paper aiming at answering, in a compact way, the following questions: (1) what are the land-use patterns among smallholders in the study region, and what are the common land-use trajectories? (2) what is the land-use intensity by smallholders in the different land-use types? (3) How do the different land-use types compare in terms of stocks, processes and ecosystem services? (4) How do these stocks, processes and ecosystem services trade-off against each other? (5) What are the implications for policy and management?

**Land-use choices and impacts on ecosystem processes and services in smallholder landscapes of Sumatra, Indonesia** (Working title)

**AIMS OF THE PAPER PROJECT**

In order to successfully apply for the next phase the CRC990 must deliver tangible proof of its ability to generate added value through interdisciplinary col-

laboration. The proposed paper should integrate the first findings of the CRC990, providing a coarse overview of the processes at plays, the main transformation systems and their ecological and economic consequences. To maximize participation, care will be taken not to go into any detail not required for this broad picture (aggregate measures, limited discussion of any particular set of data etc.). This should ensure that this paper does not stand in the way of any planned disciplinary publications by the PhD students and Postdocs.

**RESEARCH QUESTIONS:**

(1) What are the land-use patterns among smallholders in the study region, and what are the common land-use trajectories?

Providing at least a rough answer to this question is important to set the context for the rest of the study. Questionnaire data most likely provides some data on this, and possibly land-use maps.

(2) What is the land-use intensity by smallholders in the different land-use types?

Quantifying differences in the management between jungle rubber, rubber plantation and oil palm is important to understand their impact on species and processes. Land-use intensity is multidimensional and several measures should jointly assess, of which pesticide treatment frequency index, fertilization intensity, or planted tree cover, are just examples. Questionnaire data and core-plot data should cover this. This is also an opportunity to show that the core plots are representative for the type of management commonly found in the study region.

(3) How do the different land-use types compare in terms of stocks, processes and ecosystem services? The following draft table illustrates the links between measures in the field, stocks and processes, and what the land-use types deliver from anthropogenic concepts (ecosystem services).

Individual measures	Aggregate measures	Ecosystem services
Palm and rubber production	Agricultural yield	Income
Soil carbon Base saturation Cation exchange capacity	Soil fertility	Insurance value
Soil carbon Fine Root Bio-mass Aboveground biomass / Tree volume data	Carbon Stock	Climate regulation
CH <sub>4</sub> N <sub>2</sub> O	GHG Emissions	Climate regulation
Plant communities Animal communities (ants, birds, soil invertebrates etc.)	Number of endemic bird species Aggregate morphospecies richness for trees and herbs	Nature conservation value
TO BE EXTENDED	TO BE EXTENDED	TO BE EXTENDED



These data are available from most of the core plots. Sometimes several methods have been used (by different groups) to measure the same thing and information from different sources will be integrated. Aggregate values from the individual measures can be both analyzed, testing for differences between management systems, and graphically summarized using barplots or radial plots.

#### (4) How do these stocks, processes and ecosystem services trade-off against each other?

Extension of point (3). Focus will be on trade-offs between ecosystem services, contrasting different land-uses rather than management differences among plots within the same land-uses (will be done elsewhere, see Focus 2 for example). Pairwise plots or ordination plots could be useful to summarize results. The economic differences between the land-use types are evaluated. Not only investigating income effects through land-use changes, but also the effect on income risk.

#### (5) How exploiting the gained knowledge?

To give this gained knowledge practical value we need to introduce it into practical working processes. To do so, efficient incentives are necessary to motivate small scale farmers adapting to environmental friendly land-use decisions.

### Focus 2:

**TITLE: Quantifying the effects of spatial and temporal variability on ecological and socioeconomic functions**



**REPRESENTATIVES:** Holger Kreft & Stefan Schwarze

- During various meetings in 2013, a first synthesis paper under the working title Quantifying the effects of spatial variability on ecological and socio-economic functions in rainforest transformation systems was planned.
- The specific contributions of individual research projects and strategies for data analysis have been identified.
- Data analysis, however, has not yet started, because there are still gaps in data availability.
- Additionally, C-group data to elaborate socio-economic differences/similarities between the two landscapes has been compiled and awaits a comprehensive data analysis after data cleaning.
- Preliminary results of C02/C03 suggest that there exist considerable differences between the two landscapes because of their distinct historical development.

- More specifically, the following differences have been identified so far:

- Land use patterns: The Harapan landscape is characterized by large scale plantations while the Bukit 12 landscape shows smaller mosaic-like land-use patterns.
- Population diversity/cultural diversity: The villages in the Bukit 12 landscape are more homogenous and there is less spontaneous migration compared to the Harapan landscape. Moreover, the development of forest dwelling people in the two regions has been different.



### Focus 3

#### TITLE: **Scaling-up of ecological and socioeconomic functions from local to landscape and broader scales**



REPRESENTATIVES: Stephan Klasen & Katrin Meyer

TASK FORCE: Barbara Beckert, Heiko Faust, Yann Clough, Claudia Dislich, Jonas Hein, Stephan Klasen, Katrin Meyer, Miriam Vorlaufer, Kerstin Wiegand

#### Overarching aim:

Synthesize scale-related data, results and insights from the CRC and beyond

#### Novel developments:

- Selected the most promising topic for a conceptual paper from our list: Mismatch of scales of ecological and socio-economic processes
- Compiled ideas for the paper:
  - Idea: A portfolio of products must be available to fulfill consumer requirements; thus, specialization on a certain crop at the local level (e.g., farming households) requires production diversity at regional levels as well as functioning markets which can be regulated by policies which operate at even larger scales; policy interventions may for instance include transmigration schemes; the better

markets function, the more specialization can be sustained at the local level to fulfill socio-economic needs; this might not be optimal from an ecological point of view and not optimal for individual households in the case of economic shocks, policy interventions or ecological shocks

- Scale mismatch: Ecological consequences of socio-economic specialization may span a range of spatial and temporal levels and may not necessarily match or even overlap with the scales of specialization
- Context: land sparing–land sharing; socio-economic risk spreading; scale-dependent tipping points
- Approach: Design market scenarios from perfect market to virtually non-existing market and derive consequences for specialization options and ecological functions as well as their characteristic scales
- Searched literature to quantify typical scales of selected ecological and socio-economic functions (ongoing)
- Developed concrete outline of the paper (ongoing)

### Focus 4

#### TITLE: **Towards more sustainable land use in lowland tropical regions**

#### REPRESENTATIVES:

Bernhard Brümmer & Teja Tscharntke

Focus 4 contributes to understanding and improving policies. One important building block consists of the mentioned synergies and trade-offs. Increases in ecological functions may be achieved with very different changes in socioeconomic functions, depending on the exact shape of the trade-off function. This will vary between different transformation systems, but also within a given transformation system, for instance, when different input regimes are pursued or farmers have different abilities. The analysis will be further disaggregated into different subcategories of ecological and socioeconomic functions, where divergent relationships can be expected (Focus 1) Moreover, the trade-off functions are likely to change with the landscape context and the institutional environment (Foci 2 and 3). Hypotheses of Focus 4:

- (1) The unsustainable rainforest transformation systems currently observed are driven by market incentives and by inappropriate or missing policies.
- (2) Political processes are only weakly based on scientific knowledge, and the influence of scientific evidence even gets weaker at higher policy levels.



- (3) Appropriate policies can be designed that change economic incentives towards systems with higher overall levels of ecological and socioeconomic functions.
- (4) The effectiveness of policies depends on thorough understanding of the multifaceted trade-off functions, on the concrete design of policy measures and on personal incentive structures of stakeholders at various levels.

First comments and input came so far from Heiko Faust, Holger Kreft, Kevin Darras, Bernhard Brümmer, Mary Holtkamp and Claudia Dislich, but EVERYBODY is invited to contribute here. Scenarios of socioeconomic-ecological tradeoffs include the following: A the Environmentalist's Paradox, B Agroecological intensification, C Win-win solutions I, D Win-win solutions II, E The Environmental Kuznets Curve.

We plan to develop two review or opinion papers, largely independent of the data collected so far in the Jambi region:

- (1) A comprehensive review of policies towards more sustainability in tropical land use (lead author: Bernhard Brümmer)
- (2) Scenarios of socioeconomic-ecological tradeoffs in tropical land use (lead author: Teja Tschardtke)

Preparation of the second manuscript has started already, introducing five scenarios of socioeconomic-ecological relationships and underlying tradeoffs. We suggest to consider in more depth those scenarios and analyses that untangle and potentially solve socioeconomic-ecological conflicts. There is evidence that there is often much room for balancing economic and ecological needs or for finding low cost-high benefit solutions. For potential generalizations and reliable models we have to consider (i) the multiple factors involved, (ii) the multifunctionality of ecosystems and land use and (iii) the context and scale dependency of all socioeconomic-environmental relationships.



### III. Publications

Hauser-Schäublin, B. (ed.) (2013) *Adat and Indigeneity in Indonesia*. Göttingen, Cultural Property, Volume 7

Hauser-Schäublin, B. and Stefanie Steinebach (2014). *Harapan: A „No Man’s Land“ Turned into a Contested Agro-Industrial Zone*. EForTS Discussion Paper Series No.4, 1–37 (<http://webdoc.sub.gwdg.de/pub/mon/sfb990/dp-4.pdf>)

Hein, J. (2013): *Reducing emissions from deforestation and forest degradation (REDD+), transnational conservation and access to land in Jambi, Indonesia*. EForTS Discussion Paper Series No. 2, 1–33 (<http://webdoc.sub.gwdg.de/pub/mon/sfb990/2013-2.pdf>)

Hein, J., Faust, H. (2014): *Conservation, REDD+ and the struggle for land in Jambi, Indonesia*. *Pacific Geographies* 41, 20–25

Hein, J., Faust, H. (2014): *Conservation, REDD+ and the struggle for land in Jambi, Indonesia*. *Pacific Geographies* 41, 20–25

Faust, H., Schwarze, S., Beckert, B., Brümmer, B., Dittrich, C., Euler, M., Gatto, M., Hauser-Schäublin, B., Hein, J., Holtkamp, A. M., Ibanez, M., Klasen, S., Kopp, T., Krishna, V., Kunz, Y., Lay, J., Mußhoff, O., Qaim, M., Steinebach, S., Vorlaufer, M., Wollni, M. *Assessment of socio-economic functions of tropical lowland transformation systems in Indonesia*. EForTS discussion paper series No.1,

2013, 1–38 (<http://webdoc.sub.gwdg.de/pub/mon/sfb990/2013-1.pdf>)

Klasen, Stephan, Jan Priebe, and Robert Rudolf (2013). *Cash Crop Choice and Income Dynamics in Rural Areas: Evidence for Post-Crisis Indonesia*. *Agricultural Economics* 44, no.3: 349–64.

Kopp, T., Z. Alamsyah, R. S. Patricia, and B. Brümmer (2014). *Have Indonesian Rubber Processors Formed a Cartel? Analysis of Intertemporal Marketing Margin Manipulation*. EForTS Discussion Paper No. 3, 1–34 (<http://webdoc.sub.gwdg.de/pub/mon/sfb990/dp-3.pdf>)

Steinebach, S. (2013) *“Today we occupy the plantation - Tomorrow Jakarta”- Indigeneity, Land and Oil Palm Plantations in Jambi*, In: Hauser-Schäublin, B.: *Adat and Indigeneity in Indonesia*, pp: 63–81, Göttingen: Universitätsverlag Göttingen.

Wielgoss, A., Teja Tschardt, Alfianus Rumed, Brigitte Fiala, Hannes Seidel, Saleh Shahabuddin and Yann Clough 2013. *Interaction complexity matters: disentangling services and disservices of ant communities driving yield in tropical agroecosystems*. *Proc. R. Soc. B* 2014 281, 20132144, published 4 December 2013



## IV. International Conferences / Presentations

**The first SEAMEO BIOTROP International Conference on “Enhancing and Promoting the Real Values of Tropical Biodiversity of Southeast Asia”** was held at Bogor, Indonesia, on October 3–5, 2013

**B06**

**TITLE: Plant diversity in different transformation systems in Sumatra, Indonesia.**

**AUTHORS:** Katja Rembold, Sri S. Tjitrosoedirdjo, Holger Kreft

Southeast Asia is a biodiversity hotspot with globally outstanding species richness and endemism, but biodiversity and ecosystem functioning in the region are highly threatened due to alarming rates of habitat loss and land-use intensification. While most studies on the effects of land-use on tropical plant diversity have heavily relied on changes in taxonomic diversity at the plot-level, understanding changes in plant diversity at different spatial scales is essential to assess possible ecological consequences and to identify science-based options for sustainable land-use management and conservation.

In context of the German-Indonesian collaborative research center EFForTS (Ecological and Socioeconomic Functions of Tropical Lowland Rainforest Transformation Systems) we investigate land-use effects on multiple facets of vascular plant diversity at various spatial scales. Plot-based species inventories are conducted at local to regional scales across four transformation systems replicated in two different landscapes (Harapan Rainforest and Taman Nasional Bukit Duabelas, Jambi, Sumatra). Additive partitioning of regional-scale gamma-diversity will allow an evaluation of differential effects of land-use on alpha- and different beta-components in the different transformation systems. In addition to detailed investigations of changes in taxonomic diversity, functional and phylogenetic diversity and composition as well as underlying biogeographical patterns will be analyzed.

First results indicate that oil palm plantations have a surprising high alpha diversity, but very low beta diversity. Rubber plantations have a low alpha and low beta diversity while the forest reference sides have a high alpha and high beta diversity. Further, plantations show a high amount of invasive plant species and generalists while the forests are rather composed by specialists.

**The first International Conference on “Jambi Studies: History, Art and Culture, Religion and Social Change”** was held in Jambi, Indonesia, on November 21– 24, 2013

**C03**

**TITLE: Orang Rimbas’ local wisdom**

**AUTHOR:** Stefanie Steinebach

Wisdom is defined as the right use of knowledge. The importance of traditional knowledge (TK), indigenous knowledge (IK) and especially traditional ecological knowledge (TEK) for the sustainable management of natural resources is widely acknowledged. This kind of knowledge is culture specific and particularly place based. Bearers of this knowledge are defined as “indigenous” peoples or communities that can be associated with certain territories and distinct cultural expressions. The forest dwelling Orang Rimba in Jambi have become a well-known example for elaborated environmental knowledge that is inseparably interwoven with the group’s forest surrounding and cultural identity. This forest bound cultural identity differentiates the Orang Rimba from the sedentary population with varying connotations. The traditional local knowledge of the Orang Rimba is constructed in contrast to a “modern and global” knowledge by the forest surrounding communities, including hegemonic western scientific concepts.



But the Orang Rimba are threatened to lose their forest habitat and therefore their culture-specific knowledge and identity. To preserve their habitat as well as their traditional knowledge and cultural identity, the Orang Rimba strategically use what is called “modern global” knowledge.

But in the perception of non-forest dwelling communities the employment and integration of “global modern” knowledge diminishes and blurs the cultural distinctiveness and otherness of the Orang Rimba and puts their indigenous identity and their right to live in the forest under question.

I will discuss how the strategic use of different knowledge regimes by the Orang Rimba can be defined as wisdom – the right use of knowledge.

**The International Seminar on “Ecosystem Restoration in the Tropics: Lessons Learned and Best Practices”** was held in Bogor, Indonesia, on November 28, 2013.

Z02

**TITLE: Contribution of science for managing transformed landscape ecosystems**

**AUTHOR:** Jochen Drescher

Tropical rainforests are the most biologically complex ecosystems on this earth. While being home to approx. half of the currently living animal and plant species and the source of over a fourth of

the world’s natural medicines, tropical rainforests also play a key role in the regulation of our planet’s climate. Tropical rainforests are under immense threat due to human activity such as logging, mining, drilling for oil and gas and the conversion into agricultural land. With over 50% of the world’s rainforest already lost and increasing destruction rates, there is urgent need to massively reduce pressure on the yet existing forests and to search for means to restore those ecosystems which have not been destroyed beyond repair.

The CRC 990/ EForTS project is a German-Indonesian research consortium comprising four universities (Georg-August-Universität Göttingen, Institut Pertanian Bogor, Universitas Negari Jambi, and Universitas Tadulako Palu) set out to study the effects of forest transformation into agricultural land using a holistic approach. We study ecological, socioeconomic and climate effects along a transformation gradient comprising old growth lowland rainforest, jungle rubber, rubber plantation and oil palm monocultures in Jambi province, Sumatra. While currently focusing on effects of forest degradation, we further aim at including forest restoration projects into our research objectives, e. g. such as those currently in progress at PT Restorasi Ekosistem Indonesia (PT REKI), Jambi.

**The International Conference on Global Vegetation Monitoring and Modeling** was held in Avignon, France, on February 3–7, 2014.

A03

**TITLE: Quantifying the effects of land use changes in Indonesia on carbon, water and energy fluxes to the atmosphere using the CLM land surface model**

**AUTHORS:** Fan, Y., Roupsard, O., Bernoux, M., Le Maire, G., Panferov, O. and Knohl, A.

Tropical forests in South-East Asia (SEA) are essential agents in local and regional climate by recycling water, absorbing/releasing greenhouse gases (GHGs), and transforming energy, and they also have the potential for mitigating global warming through evaporative cooling and carbon sequestration. Land use changes (LUC) in SEA tropical regions have been accelerated by economic development and policy reforms in the past 30 years. Among these regions, Indonesia has been the focus of much international attention over recent years due to its increasing rate of LUC and GHG emission, as well as its readiness and commitment to the Reducing Emissions from Deforestation and forest Degradation (REDD) program. Indonesia’s deforestation rate since 1996 has been the highest in the world, estimated at 2 million ha per year, ca. 10–20% of the world total. One of the major reasons is the economy-driven expansion of oil palm (*Elaeis*



guineensis) plantations. In 2011, Indonesia's oil palm plantations produced ~44% of palm oil worldwide and it has indicated the potential to double its oil-palm area from 9.7 million ha in 2009 to 18 million ha by 2020. LUCs induced by oil palm expansion may compromise the continued provision of other ecosystem services, such as maintenance of biodiversity, storage of carbon and mitigation of climate change. It has been found that undisturbed forest has significantly higher capacity to store and sequester carbon than disturbed or managed vegetation. Deforestation and forest degradation has become the major source of GHG emission for Indonesia, placing it as the world's third largest carbon dioxide emitter. Changes of land surface properties (e.g. vegetation composition, soil property, surface albedo) associated with drastic LUCs, especially rainforest to oil palm conversion, might alter the patterns of land-atmosphere energy, water and carbon fluxes and therefore affect regional or global climate. However, questions remain about the specific mechanisms, degrees and trends of these effects. Traditional field-based methods are limited in their ability, by expense, time and spatial scales, to investigate LUC effects on land-atmosphere fluxes. Earth system modeling and remote sensing provide a means for quantifying land surface dynamics and their effects across a variety of spatial and temporal scales. Expanding sources of remote sensing data (e.g. MODIS, Landsat) enable efficient and repeatable monitoring of land cover changes and provide useful parameter data such as land cover classifications and leaf area index (LAI) across time for modeling purposes. Land surface modeling

has been widely used to characterize the two-way interactions between climate and human disturbances in terrestrial ecosystems such as deforestation, agricultural expansion and urbanization. The Community Land Model (CLM) is a third-generation land surface model and is the land component of the Community Earth System Model (CESM). It simulates a wide range of biogeophysical and biogeochemical processes including surface energy fluxes, hydrology and carbon/nitrogen cycles. This project utilizes the land-cover/land-use change (LCLUC) capability of the latest CLM versions 4/4.5 to characterize quantitatively how anthropogenic land surface dynamics in Indonesia affect land-atmosphere carbon, water and energy fluxes. Through the combined strength of remote sensing and land surface modelling we aim to accomplish the following objectives: (1) Parameterize CLM for land-use transformation system in Indonesia, which entails the creation and parameterization of a new plant functional type (PFT) for oil palm that allows for simulation of photosynthesis and carbon allocation. (2) Model the impacts of historical LUCs on carbon, water and energy fluxes and validate CLM modelled fluxes with field measurements at selected eddy covariance (EC) flux tower sites (e.g. a rainforest site in Bariri, Sulawesi; an oil palm site in Jambi, Sumatra). (3) Project the effects of future LUCs on the fluxes and carbon sequestration capacity under different LUC scenarios such as business-as-usual scenario, food production scenario, forest preservation scenario, carbon conservation scenario, and hybrid scenario. Our initial results include outputs from a single-point simulation for the Bariri rainforest site

forced with field meteorological data, which are to be compared with EC flux observations and with Mixfor-SVAT model outputs from another project in the same site. We are also conducting sensitivity analyses on model parameters and collecting oil palm optical, morphological and physiological parameters that are necessary to configure the new PFT and represent rainforest to oil palm conversion. We envision our upcoming findings will enhance the understanding of regional and global climatic trends in the context of drastic land cover changes and support decision makers to adopt proper forest conservation and land use strategies in respect to UN REDD or REDD+ or REALU.

**The Annual Conference of the Society for Tropical Ecology: "Tropical Ecosystems - Between Protection and Production"** was held in Freising-Weihenstephan, Germany, on February 25–28, 2014

**B11**

**TITLE:** **Tree islands in a sea of oil palms - a measure of biodiversity conservation?**

**AUTHORS:** Anne Gérard, Miriam Teuscher, Prijanto Pamoengkas, Hendrayanto, Leti Sundawati, Bambang Irawan, Yann Clough, Ulrich Brose, Dirk Hölscher, Holger Kreft



Transformation of rainforest into large-scale mono-cultural oil palm plantations has led to dramatic losses in biodiversity and ecological functions. Re-establishing diverse habitats by restoring ecological multi-functionality in oil palm landscapes has been proposed, but the hampering or facilitating ecological and economical processes are largely unknown.

We report on the recent establishment of an enrichment planting experiment in gaps within a mono-cultural large-scale oil-palm plantation in the province of Jambi, Sumatra, Indonesia. This combined biodiversity ecosystem functioning and enrichment planting experiment addresses two main questions: 1) Can biodiversity and associated ecosystem services be restored by enrichment planting? 2) Under which planting strategies do enhanced ecosystem services positively affect oil palm economics?

We planted 48 tree islands of systematically varying size (5x5 m, 10x10 m, 20x20 m, 40x40 m) with a total of 6354 individual trees belonging to six multi-purpose species native to Sumatra, following a random partitions design with four partitions series (tree diversity levels of six, three, two and one) plus four treatments without planting subject to natural succession, resulting in a total of 52 plots. The monitoring of ecological processes currently focuses on 1) seed traps to study seed rain, 2) annual individual-based surveys of the understory vegetation surveys within 2x2m subplots in each of the 52 plots to investigate the successional trajectory, 3) growth rates and survival of the planted trees

and 4) harvest data of oil palm within and next to the plot are documented.

Combining the botanical with zoological monitoring data (arthropods and birds), the results of the enrichment planting experiment will allow us to evaluate the effectiveness of proposed designer plantation landscapes, and may contribute to the development of ecologically improved and socio-economically viable management concepts in oil palm landscapes.

**The 4th International DAAD Workshop on "The Ecological and Economic Challenges of Managing Forested Landscapes in a Global Context"** was held in Bogor and Jakarta, Indonesia, on March 16–22, 2014.

#### B05

**TITLE: Remote sensing based monitoring of land transformation in Jambi Province, Sumatra**

**AUTHORS:** Dian N. Melati, I Nengah Surati Jaya, Muhammad Zuhdi, César Pérez-Cruzado, Lutz Fehrmann and Christoph Kleinn

Tropical forested landscapes are playing an important role in context of conservation of biodiversity and mitigating climate change. However, forests are under great pressure in the tropics and land

transformation is ongoing in many places from forest to agriculture. In our study area in Jambi Province, Sumatra, Indonesia, this transformation is mainly the result of the expansion of tree crops. In order to the study land transformation dynamics, maps from the years 1990, 2000 and 2011 were analysed for land use/land cover (LULC) changes: the largest transformation took place for the classes of secondary dryland forest and secondary swamp forest, which were transformed mainly into (temporary) shrub, plantation forests, mixed dryland agriculture, estate crops and bare lands. While transformation of secondary dryland forest took place with similar areas in the periods of 1990–2000 and 2000–2011, there was a marked difference for the changes of secondary swamp forest: the transformation in 1990–2000 did leave only a relatively small area of secondary swamp forest, so that the transformed area in 2000–2011 was much smaller. In addition to the analyses of overall changes, we also looked at their spatial pattern: while aggregation went slightly down for classes secondary dryland forest and secondary swamp forest from 1990 to 2011, there are clear differences regarding number of patches: for secondary dryland forest, the number of patches increased clearly, while for secondary swamp forest it went down, indicating different processes of fragmentation for these two classes.



**The European Geosciences Union (EGU) General Assembly** was held in Vienna, Austria, on April 28–May 2, 2014

### A03 / Z02

**TITLE: CO<sub>2</sub> and energy fluxes from an oil palm plantation in Sumatra, Indonesia**

**AUTHORS:** Ana Meijide, Mathias Herbst, Alexander Knohl

Oil palm plantations are expanding in Indonesia due to global increased demand of palm oil. Such plantations are usually set in previously forested land and in Sumatra, massive transformation of lowland forest into oil palm plantations is taking place. These land transformations have been identified as a potential driver of climate change, as they might result in changes of greenhouse gas (GHG) fluxes. However, very limited information is available on GHG fluxes from oil palm plantations and their sink or source strength at ecosystem scale is yet unknown.

An eddy covariance tower was therefore installed in a 2 year old oil palm plantation in the province of Jambi, Sumatra (1°50' 7"S, 103°17' 44"E), with the aim of studying carbon dioxide, water and energy fluxes during the non-productive phase of oil palm cultivation. The canopy was not yet closed and trees were around 2m high. The eddy covariance system consists of a Licor 7500A and an ultrasonic Metek Anemometer, operating at 10 Hz and installed on a

7m tower. In addition to the eddy Covariance measurements, the site is equipped with a weather station, measuring short and long wave radiation, PAR, rainfall, profiles of air temperature, air humidity and wind speed, soil temperature and moisture and soil heat fluxes. Measurements started in July 2013 until January 2014, in order to capture possible differences which may happen during the dry (July-October) and wet (November-February) seasons.

A large CO<sub>2</sub> uptake would have been expected at this young oil palm plantation, as palm trees during this period of their cultivation are growing fast. However, our preliminary results show that during the first 5 months of measurements, the ecosystem was a small carbon source (below 10 g CO<sub>2</sub> m<sup>-2</sup>). Latent heat flux was higher than sensible heat flux during the period of study, indicative of the high evaporation taking place. Our results show that both for CO<sub>2</sub> and energy fluxes, large differences were observed between the dry and wet seasons. First analyses indicate that the young oil palm plantation could act as a CO<sub>2</sub> source in the dry season and as a sink in the wet season. The possible driving factors will be discussed.

### A03

**TITLE: Simulating carbon, water and energy fluxes of a rainforest and an oil palm plantation using the Community Land Model (CLM4.5)**

**Authors:** Yuanchao Fan, Martial Bernoux, Olivier

Roupsard, Oleg Panferov, Gueric Le Maire, Merja Tölle and Alexander Knohl

Deforestation and forest degradation driven by the expansion of oil palm (*Elaeis guineensis*) plantations has become the major source of GHG emission in Indonesia. Changes of land surface properties (e.g. vegetation composition, soil property, surface albedo) associated with rainforest to oil palm conversion might alter the patterns of land-atmosphere energy, water and carbon cycles and therefore affect local or regional climate. Land surface modeling has been widely used to characterize the two-way interactions between climate and human disturbances on land surface. The Community Land Model (CLM) is a third-generation land model that simulates a wide range of biogeophysical and biogeochemical processes. This project utilizes the land-cover/land-use change (LCLUC) capability of the latest CLM versions 4/4.5 to characterize quantitatively how anthropogenic land surface dynamics in Indonesia affect land-atmosphere carbon, water and energy fluxes. Before simulating land use changes, the first objective is to parameterize and validate the CLM model at local rainforest and oil palm plantation sites through separate point simulations. This entails creation and parameterization of a new plant functional type (PFT) for oil palm, as well as sensitivity analysis and adaptation of model parameters for the rainforest PFTs. CLM modelled fluxes for the selected sites are to be compared with field observations from eddy covariance (EC) flux towers (e.g. a rainforest site in Bariri, Sulawesi; an oil palm site in Jambi, Sumatra). After validation,



the project will proceed to parameterize land-use transformation system using remote sensing data and to simulate the impacts of historical LUCs on carbon, water and energy fluxes. Last but not least, the effects of future LUCs in Indonesia on the fluxes and carbon sequestration capacity will be investigated through scenario study. Historical land cover changes, especially oil palm coverage, are retrieved from Landsat or MODIS archival images. Oil palm concession boundaries are used to define and project future land use scenarios.

Initial results include outputs from a single-point simulation for the Bariri rainforest site forced with locally measured meteorological data which already showed significant advantage over global forcing data in predicting net ecosystem exchange and latent and sensible heat fluxes. Modeled fluxes are being compared with EC flux observations and with Mixfor-SVAT model outputs from another project at the same site. In the next few months, focus will be on sensitivity analyses of model parameters including PFT optical, morphological and physiological parameters that are necessary to configure the new oil palm PFT and represent rainforest to oil palm conversion. The new parameterization will contribute to the development of the CLM model and its implementation in the modelling of LUC effects in tropical regions will help understanding land-climate interactions.

**The second DFG/International Council for Science (ICSU)/International Social Science Council (ISSC) Young Scientists Networking Conference on Integrated Science on the topic of "Ecosystems and human wellbeing in the green economy,"** will be held at Villa Vigoni, Italy, on May 25–31, 2014.

#### B10

**TITLE: Ecological and socioeconomic functions of tropical lowland rainforest transformation systems in Sumatra, Indonesia**

**AUTHORS:** Claudia Dislich, Elisabeth Hettig, Katrin Meyer, Jann Lay, Kerstin Wiegand

The project aims at providing science-based knowledge on how to protect and enhance the ecological functions of tropical forests and agricultural transformation systems at a landscape scale, while at the same time improving human welfare. Further, the program aims at providing baseline information on how to integrate agricultural land use and conservation issues. The research area is the Jambi Province of Sumatra, where core plots of transformation systems (oil palm and rubber plantations as well as extensive rubber) and forest reference sites where established for detailed data collection. In parallel, several socio-economic sub-projects collected data on household and village level. The different sub-projects will analyze and compare a broad

range of issues, including above and below ground biodiversity, soil fertility, water, nutrient and greenhouse gas fluxes, as well as economic, social, cultural and political aspects related to rainforest transformation.

The findings of these projects will be used as input for an integrated modeling framework that will be developed to investigate synergies and trade-offs among and between the various ecological and socioeconomic functions. With the model different landscape mosaics can be compared in terms of biodiversity, ecosystem function and economic benefit. Furthermore, potential outcomes of different policy options can be tested.

**The 8th North American Productivity Workshop (NAPW)** will be held in Ottawa, Canada, on June 4–7, 2014

#### C01

**TITLE: Technical and environmental efficiency of smallholder palm oil and rubber production**

**AUTHORS:** Anna Mareike Holtkamp and Bernhard Brümmer

In many tropical areas, rainforests are cleared in order to exploit timber and other forest products and plant crops for food, feed and fuel use. The rapid augmentation of intensive production and substantial decline in forested land has been observed with



concerns about the effects on ecological systems. Especially the threats to biological diversity conservation, sustainability of production with respect to soil and water pollution and climate change seem alarming. A possible approach to generally reduce the expansion of production activities into new areas and therefore reduce the ecological impact on the environment, while simultaneously sustaining the economic opportunities, is the attempt to move smallholders closer to the best-practice frontier in technical and environmental terms. This will be the focus of this paper. We provide a new statistical framework, since the measurement of environmental efficiency has not yet been standardized and productive efficiency in perennial crops has, to our knowledge, received scant attention. Reinhard (1999) provides the first approach in the field of environmental efficiency using a stochastic frontier approach with a translog production function to calculate the technical- and environmental efficiency of Dutch dairy. We consider also concepts of the distance functions framework (Cuesta et al. (2000), Färe & Grosskopf (2004)), index base approaches and shadow costs systems (Thijssen (2000)) to perform our efficiency measurement. Our data stretches over five regions in Jambi province in Indonesia. It includes economic data covering the agricultural production of farmers at plot-level and household-level. Additionally the data embraces a unique set of environmental data including biodiversity measures, soil quality and chemical pressure at plot-level. Results are expected to show a trade-off between the economic performance and environment pressure, which indicate a decrease of the

environmental values when the economic utility is increased. Preliminary results generated from our data confirm these expected results so far.

**The International Union for the Study of Social Insects (IUSSI14) will be held** in Cairns, Australia, on July 13 – 18, 2014

Z02

**TITLE: Population-level differentiation between Yellow Crazy Ant supercolonies in South-East Asia**

**AUTHORS:** Jochen Drescher, Heike Feldhaar, Thomas Schmitt, Stefan Scheu, Damayanti Buchori

The Yellow Crazy Ant (YCA) *Anoplolepis gracilipes* ranks among the most destructive social insect invaders in South-East Asia and the Indopacific. It is believed that their ability to form vast polydomous, polygynous supercolonies is the key to their ecological success. This is particularly true in Arnhem Land, NE-Australia, where a single supercolony spans up to 80km across, covering more than 15.000 km<sup>2</sup> in total (Gruber et al. 2011). In Sabah, North-East Borneo, however, YCA population structure is very different. Here, YCA supercolonies are no larger than 300m across and many supercolonies of varying sizes compete for resources within the same population. Using data from two independent popu-

lations of supercolonies, we will demonstrate that YCA supercolonies in NE-Borneo are genetically and chemically (Cuticular Hydrocarbons) differentiated to such an extent that it suggests lack of gene flow between them. We argue that positive feedback between behavioral, genetic and chemical differentiation will further intensify intercolonial segregation, possibly leading to reproductive isolation between different YCA supercolonies and thus, speciation. Preliminary experiments using a limited set of laboratory colonies suggest a reproductive barrier between distantly related YCA supercolonies. It is currently unclear whether this is due to worker-policing or the inability of queens mated with males from foreign supercolonies to produce vital offspring. We aim at further studying the potential reproductive barrier between YCA supercolonies along a gradient of genetic similarity by cross-breeding males and queens from variably related supercolonies. To identify suitable supercolonies, we performed a population genetic analysis of YCA populations in Jambi, Central Sumatra, sampling from over 30 supercolonies that are as far as 100km apart. We thus present first genetic data on that population and discuss the experimental design with which we intend to identify the degree of genetic distance at which males and queens from different YCA supercolonies are reproductively isolated.



**The 51<sup>st</sup> Annual Meeting of the Association for Tropical Biology and Conservation (ATBC) on “The future of tropical biology and conservation”** will be held in Cairns, Australia on July 20–24, 2014

## B06

**Authors:** Katja Rembold, Hardianto Mangopo, Sri Sudarmiyati Tjitrosoedirdjo, Indah Wahyuni, Holger Kreft

**Title:** **Consequences of Rainforest transformation for plant diversity in Sumatra, Indonesia**

Southeast Asia is a biodiversity hotspot with globally outstanding species richness and endemism, but biodiversity and ecosystem functioning in the region are highly threatened due to alarming rates of habitat loss and land-use intensification. We studied land-use effects on multiple facets of vascular plant diversity at various spatial scales. Plot-based species inventories were conducted at local to regional scales across four transformation systems (tropical lowland rainforest, jungle rubber, rubber plantations and oil palm plantations) in Jambi Province (Sumatra, Indonesia).

While oil palm plantations had the highest abundances of herb layer species, forest had the highest species numbers at plot- and landscape-scale. The jungle rubber agroforestry system ranks second in terms of species richness, but includes high num-

bers of invasive species which are likewise abundant in the plantations, but rare in forest. Rubber plantations were characterized by both, rather low abundance and low diversity of herb layer plant diversity.

These data help to understand changes in plant diversity at different spatial scales which is essential to assess possible ecological consequences and to identify science-based options for sustainable land-use management and conservation.

**The 8th BIOGEOMON International Symposium on Ecosystem Behavior** will be held in Bayreuth, Germany on July 13–17, 2104

## A04

**TITLE:** **Assessing impacts of lowland rainforest transformation systems on soil organic matter and erosion using  $\delta^{13}\text{C}$**

**AUTHORS:** Thomas Guillaume, Damris Muhammad and Yakov Kuzyakov

Converting natural rainforest into agricultural systems leads to abrupt changes of biogeochemical cycles. Such land use changes modifying the carbon (C) cycle result in losses of soil organic carbon (SOC), an important fertility parameter especially in heavily weathered soil. Losses of SOC are consequences of two processes i) a modification of the

balance between C input (reduced litter deposition) and C output (enhanced mineralization or increase of DOC leaching) or of ii) soil erosion of the top carbon-rich layer due to a lack of protective litter and canopy layer. Both processes also impact the isotopic signature of SOC. Higher  $\delta^{13}\text{C}$  values of SOC are associated with organic matter which has undergone a more extended decomposition by microbial activity. This is reflected in the increase of  $\delta^{13}\text{C}$  values with depth. Therefore, we hypothesize that we can use  $\delta^{13}\text{C}$  values of SOC to disentangle the losses by erosion and decomposition.

Our study aims i) to quantify the impacts of conversion of tropical lowland rainforest into oil palm, intensive rubber and extensive rubber plantations on SOC and ii) to identify the contribution of processes driving the losses of SOC using natural abundance of  $\delta^{13}\text{C}$ . Because of the young age of the plantations, we hypothesized that changes in SOC turnover would affect  $\delta^{13}\text{C}$  values mainly in the top soil. Therefore, constant higher  $\delta^{13}\text{C}$  values at same depths of subsoil of plantations compared to subsoil of forests would result from erosion.

Results showed a strong decrease of C content in A horizon according to land-use intensity; up to 70% in oil palm plantations. Sign of erosion, according  $\delta^{13}\text{C}$  values, were observed in oil palm and intensive rubber plantations. We calculated a potential erosion of  $37 \pm 14$  cm and  $28 \pm 13$  cm respectively.

While classical methods to measure erosion usually involve heavy field equipment or long-term monitoring,  $\delta^{13}\text{C}$  analysis which have become a routine measurement can provide a cheap and fast insight on these processes.



## A05

**TITLE: Soil carbon dioxide and methane fluxes from lowland forests converted to oil palm and rubber plantations in Sumatra, Indonesia**

**AUTHORS:** Evelyn Preuß, Marife D. Corre, and Edzo Veldkamp

Demand for palm oil has increased strongly in recent decades. Global palm oil production quadrupled between 1990 and 2009, and although almost half of the global supply is already produced in Indonesia, a doubling of current production is planned. Furthermore, Indonesia is the second largest rubber producer in the world and global demand for rubber is high. Land-use changes are known to influence soil carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) fluxes. Although most of Indonesian palm oil and rubber is generated in Sumatra, greenhouse gas measurements from oil palm and rubber plantations are scarce in this region. Our study was aimed to assess changes in soil CO<sub>2</sub> and CH<sub>4</sub> fluxes with rainforest conversion to oil palm and rubber plantations. Our study region was in Jambi province, Sumatra, Indonesia, where forest conversion to oil palm and rubber is widespread. We measured soil-atmosphere CH<sub>4</sub> and CO<sub>2</sub> fluxes using vented static chamber method for thirteen months (November 2012 to December 2013). The study region was delineated into two soil landscapes: sandy loam and clay Acrisol soils. At each landscape, we selected four land-use systems: lowland rainfor-

est (as reference land use), rubber interspersed in naturally regenerating secondary forest (referred here as jungle rubber), and monoculture plantations of rubber (7–17 years old) and oil palm (9–16 years old). Each land-use system was represented by four sites (as replicates), and measurements were conducted within a 50 m x 50 m area of each site. In both soil landscapes, soil CO<sub>2</sub> fluxes from oil palm were lower compared to the other land-use systems ( $P = 0.0068$ ). In the clay Acrisol, soil CO<sub>2</sub> fluxes were  $107.2 \pm 7.2 \text{ mg C m}^{-2} \text{ h}^{-1}$  for oil palm, and  $195.9 \pm 13.5 \text{ mg C m}^{-2} \text{ h}^{-1}$  for forest,  $185.4 \pm 9.4 \text{ mg C m}^{-2} \text{ h}^{-1}$  for jungle rubber and  $182.8 \pm 16.2 \text{ mg C m}^{-2} \text{ h}^{-1}$  for rubber. Similar trend was observed in the sandy loam Acrisol:  $115.7 \pm 11.0 \text{ mg CO}_2\text{-C m}^{-2} \text{ h}^{-1}$  for oil palm, and  $186.6 \pm 13.7$ ,  $178.7 \pm 11.2$ ,  $182.9 \pm 14.5 \text{ mg CO}_2\text{-C m}^{-2} \text{ h}^{-1}$  for forest, jungle rubber and rubber, respectively. For soil CH<sub>4</sub> fluxes, in the clayey Acrisol, CH<sub>4</sub> uptake in the forest ( $40.3 \pm 10.3 \text{ } \mu\text{g CH}_4\text{-C m}^{-2} \text{ h}^{-1}$ ) was higher ( $P = 0.0041$ ) than in the rubber ( $3.0 \pm 1.3 \text{ } \mu\text{g CH}_4\text{-C m}^{-2} \text{ h}^{-1}$ ) and oil palm ( $6.4 \pm 3.1 \text{ } \mu\text{g CH}_4\text{-C m}^{-2} \text{ h}^{-1}$ ) but comparable to jungle rubber ( $20.8 \pm 7.2 \text{ } \mu\text{g CH}_4\text{-C m}^{-2} \text{ h}^{-1}$ ). In the sandy loam Acrisol, there were no significant differences in CH<sub>4</sub> uptake among land-use systems with fluxes of  $1.6 \pm 17.1$ ,  $26.9 \pm 3.9$ ,  $9.7 \pm 3.8$ ,  $14.9 \pm 3.1 \text{ } \mu\text{g C m}^{-2} \text{ h}^{-1}$  for forest, jungles rubber, rubber and oil palm plantations, respectively. Our results showed that conversion of rainforest to monoculture systems of oil palm and rubber plantations altered soil CO<sub>2</sub> and CH<sub>4</sub> fluxes and hence should be considered in the greenhouse gas life-cycle analysis of these economically important crops.

## A05

**TITLE: Nutrient leaching losses from lowland forests converted to oil palm and rubber plantations in Sumatra, Indonesia**

**AUTHORS:** Syahrul Kurniawan, Sri Rahayu Utami, Christanti Agustina, Edzo Veldkamp, and Marife D. Corre

In the last two decades, Sumatra, Indonesia is experiencing rapid expansion of oil palm and rubber plantations through conversion of rainforests. Forest conversion to oil palm and rubber plantations are expected to increase nutrient leaching losses, following the changes in soil cover, litter input, rooting depth, and nutrient cycling. Our study was aimed to assess the impact of land-use change on nutrient leaching losses, fine-root mass and its distribution with soil depth. In the study region (Jambi province, Sumatra), two soil landscapes were selected: sandy loam and clay Acrisol soil. At each landscape, we selected four land uses: lowland rainforest (as reference), rubber interspersed in naturally regenerating secondary forest (referred here as jungle rubber), rubber (7–17 yr old) and oil palm plantations (9–16 yr old). Each land use was represented by four sites (as replicates, 50x50m each), and at each site two lysimeters were installed at 1.5-m depth. Soil water was collected biweekly and we present here our preliminary results covering March–June 2013. In sandy loam Acrisol, oil palm, jungle rubber and rainforest had higher ( $P < 0.00$ ) nitrate (NO<sub>3</sub><sup>-</sup>) leaching ( $0.17 \pm 0.04$ ,  $0.10 \pm 0.01$ , and  $0.08 \pm 0.02$



mg N L<sup>-1</sup>, respectively) than the rubber plantation (0.02±0.01 mg N L<sup>-1</sup>). In clay Acrisol, oil palm had the highest (P<0.00) NO<sub>3</sub><sup>-</sup> leaching (0.44±0.02 mg N L<sup>-1</sup>), followed by the rubber (0.16±0.02 mg N L<sup>-1</sup>), rainforest (0.10±0.01 mg N L<sup>-1</sup>), and the jungle rubber (0.02±0.00 mg N L<sup>-1</sup>). Differences in ammonium (NH<sub>4</sub><sup>+</sup>) and dissolved organic nitrogen (DON) leaching losses among land uses were significant only in sandy loam Acrisol (P<0.00). Rainforest had higher NH<sub>4</sub><sup>+</sup> leaching (0.22±0.04 mg N L<sup>-1</sup>) than oil palm (0.14±0.02 mg N L<sup>-1</sup>) and rubber (0.13±0.02 mg N L<sup>-1</sup>); jungle rubber (0.18±0.04 mg N L<sup>-1</sup>) did not differ from all these land uses. Rainforest had the highest DON leaching (0.27±0.19 mg N L<sup>-1</sup>), followed by oil palm (0.09±0.02 mg N L<sup>-1</sup>), jungle rubber (0.07±0.04 mg N L<sup>-1</sup>), and the rubber plantation (0.03±0.01 mg N L<sup>-1</sup>). For fine-root mass, in the sandy loam Acrisol oil palm had higher (P=0.04) fine root (368±53 g m<sup>-2</sup>) than rubber (187±38 g m<sup>-2</sup>) and jungle rubber (144±33 g m<sup>-2</sup>); rainforest (290±83 g m<sup>-2</sup>) did not differ from any of these land uses. The β value (i.e. low β value indicates surficial root distribution; high β value indicates larger proportion of fine root at deeper soil depth) in oil palm (0.941±0.007) was lower (P<0.00) than in rainforest (0.968±0.003), jungle rubber (0.963±0.003), and rubber (0.964±0.002). Similar patterns were observed in clay Acrisol: oil palm had higher (P<0.00) fine root (681±85 g m<sup>-2</sup>) but with lower (P<0.00) β value (0.949±0.006) than jungle rubber (402±66 g m<sup>-2</sup>; β=0.963±0.005), rubber plantation (310±16 g m<sup>-2</sup>; β=0.956±0.003), and rainforest (139±32 g m<sup>-2</sup>; β=0.969±0.001). Our results indicated that the conversion of rainforests to oil palm plantations increased NO<sub>3</sub><sup>-</sup> leaching losses,

which was supported by their surficial fine-root distribution.

#### A05

#### TITLE: Soil nitrogen cycling in lowland forests converted to oil palm and rubber plantations in Sumatra, Indonesia

AUTHORS: Kara Allen, Marife D. Corre, Edzo Veldkamp

Tropical lowland forests are typically characterized by high nitrogen (N) pools with high N cycling rates, which allow these systems to accumulate and recycle large amounts of N. Over the last two decades, deforestation practices in Sumatra and Kalimantan, Indonesia have resulted in a 40% decrease in lowland forest coverage. In order to supply the ever-increasing demand for products such as palm oil and rubber, agricultural development will continue to replace areas of tropical lowland rainforest in Southeast Asia. Conversion of these forests can have profound effects on soil nutrient cycling. Land-use changes can lead to lower soil N cycling rates, which in turn can lead to changes in N losses from the system (e.g. nutrient leaching and emissions of climate relevant N-oxide gases). The aim of this study was to assess changes in soil N cycling rates with land-use change. The study region was Jambi Province in central Sumatra, Indonesia—an area that was once heavily forested, but has experienced high forest conversion. Two soil landscapes were selected to represent the region: sandy loam and clay Acrisol soils. In each soil landscape, four

land-use systems were examined: lowland rainforest (as reference), rubber interspersed in naturally regenerating secondary forest (referred here as jungle rubber) and monoculture plantations of rubber (7–17 years old) and oil palm (9–16 years old). Net soil N cycling rates (i.e. net N mineralization and net nitrification) were measured using in-situ buried bag method and gross rates of N cycling (i.e. N mineralization, nitrification, and microbial N assimilation) were measured using the 15N pool dilution technique on intact soil cores incubated in-situ. In both landscapes, net N cycling rates were higher in the forest than in the land-use systems, while gross N cycling rates varied across landscapes and land-uses. Ammonium (NH<sub>4</sub><sup>+</sup>) cycling processes (gross N mineralization and NH<sub>4</sub><sup>+</sup> immobilization) tended to be higher in the clay Acrisol than in the sandy loam Acrisol. Nitrate (NO<sub>3</sub><sup>-</sup>) pools and gross nitrification rates in both landscapes were lower in the jungle rubber and rubber plantations than in the forest and oil palm plantations. This could potentially correspond to studies indicating that rubber trees limit nitrification through the production of monoterpenes. In general, microbial N pools were higher in the clay Acrisol, and were lowest in the rubber and oil palm plantations in both landscapes. Turnover rates of microbial N pools were also slower in the oil palm plantations compared to the other land-use systems. This evidence suggests that conversion of rainforest to more intensively managed monoculture systems, such as oil palm plantations, could potentially reduce the cycling of N and slow down the turnover of N in the system, which may increase losses of externally added N.



## V. News from Indonesia

### 1. Research projects funded by Indonesian government

#### 1.1. Competitive DIKTI Research Grant (DG for Higher Education)

Scheme#1: International Research Collaboration and Publication  
[Source: <http://simlitabmas.dikti.go.id/>]

#### New research projects

**TITLE:** Ecological Services of Transformed Ecosystem: The role of Ants and Termites in different land-use in Jambi  
**Dr. Idham Sakti Harahap** – IPB  
(Counterpart of B09)

**TITLE:** Practical Application of DNA Barcoding for Conservation of Endangered Tree Species  
**Prof. Iskandar Z. Siregar** – IPB  
(Counterpart of B03)

#### Project extensions

**TITLE:** Impacts of Oil Palm Plantation and Forest Patches Landscape Mosaic on Catchment Water Balance  
**Dr Suria Darma Tarigan** – IPB  
(Counterpart of B10)

### Scheme#2: National Strategic Research

#### New research projects

**TITLE:** Inovasi Metode dan Model Estimasi Biomassa dan Massa Karbon Hutan Karet Rakyat Dengan Kombinasi Cara Terrestrial dan Aerial (*Innovation on the methods and estimation models for carbon mass in Jungle Rubber through Terrestrial and Aerial Approaches*)  
**Prof. Elias**  
(Counterpart of B04)

#### 1.2. IPB Operational Block Grant (BOPTN) [Source: <http://lppm.ipb.ac.id>]

#### Project extensions

**TITLE:** Status and Population Genetics of Two Dyera species (Jelutung) in Jambi  
**Dr. Ulfah J. Siregar** – IPB  
(Counterpart of B03)

#### New research projects

**TITLE:** Konservasi Air Dan Tanah Dengan Legum Pada Berbagai Kemiringan Kebun Sawit Dan Karet Di Kawasan Hutan Harapan Di Jambi (*Soil and water conservation with legumes on different slopes of oil palm and rubber plantation around Harapan Rainforest-Jambi*)  
**Dr. Herdhata Agusta** - IPB  
(Counterpart of A02)

## 2. Management

### UNJA

a. **Dr. Bambang Irawan** has been appointed by Prof. Aulia Tasman – Rector of the University of Jambi – as Dean of the Forestry Faculty of UNJA with effect from 19 February 2014.

### IPB

b. **Prof. Herry Suhardiyanto** – Rector of IPB – has been elected as new Chairman of the Indonesian State University's Rector Council/MRPTNI (2014-2016):  
<http://www.mb.ipb.ac.id/news/view/id/6abea910617b7969f2807f04b2e69466/judul/ucapan-selamat-terpilihnya-rektor-ipb-sebagai-ketua-mrptni-periode-2014-2016.html>

c. **Prof. Damayanti Buchori** – member of the JMB IPB and Counterpart of B09 has been elected as member of the IPB Academic Senate (2014-2019) representing the IPB Board of Professors (DGB IPB).

### BMKG

d. **Dr. Dodo Gunawan** (counterpart of A03) – has been appointed as Director for Climate Change and Air Quality at BMKG (Meteorology Climatology and Geophysics Agency) based in Jakarta with effect from 25 February 2014: <http://www.bmkg.go.id>.

### 3. Conferences, Seminars, Workshops

#### UNJA

- a. *The international seminar on oil palm – livestock integration towards sustainable and future oil palm plantation management systems* was held at Jambi, Sumatra on March 6, 2014.
- The aim of the international seminar was to investigate the benefits arising from integrating livestock into oil palm plantation management (e.g. maximization of land use, weed control). Representatives from PTPN VI, PT Humusindo (two oil palm estates cooperating with the CRC 990), and both the Ministry of Agriculture and the Estate office in Jambi participated. The agenda and proceedings of the seminar are deposited on the CRC web site at: <http://www.uni-goettingen.de/de/310995.html>.



- b. The seminar *International Collaboration, Immigration Procedure, and Permit for Foreign Research* was held at UNJA on February 12, 2014.
- Participants of the meeting were representatives from the Bureau of Planning and International Cooperation of the Ministry of Education and Culture, the Immigration Office in Jambi, the Police office in Jambi, the National and Political Unity as well as representatives /students of UNJA and employees of the CRC 990. Conference topics were visa regulations and monitoring, and the establishment of an international office at UNJA to manage international collaboration and affairs.
- c. The International Conference on *Jambi Studies: History, Art and Culture, Religion and Social Change* took place from 21–24 November 2013 in Jambi (Further information is provided on the webpage: <http://www.uni-goettingen.de/de/310995.html>).
- Stefanie Steinebach / C03 gave a talk on *Orang Rimba di Jambi*.



#### IPB

- a. A two week workshop on *Determination of Soil Animals* was held at the Biotechnology Lab, Department of Soil Sciences and Land Resources at IPB, on March 11–21, 2014
- Dr. Rahayu Widyastuti, IPB and Dr. Bernhard Klärner, Postdoc of B08 gave an introductory course on sampling and determination of soil animals for ecological studies. Six master and 2 bachelor students from Dr. Rahayu Widyastuti's workgroup and two employees of the zoology division of LIPI participated. Soil and litter samples were taken from a forest site and a neighboring clearing, and soil animals were extracted using heat extraction. The application of determination keys was practiced. Abundances of major soil animal groups were assessed and differences between the habitats were evaluated and discussed.





b. The IPB-EFForTS Seminar Series ICES started in 2014.

- The Sustainable Resource Management Seminar was held at the Faculty of Economics and Management on March 3, 2014
- Prof. Heiko Faust, C02 gave a presentation on *Update on Group C – Human Dimension*
- Dr. Soeryo Adiwibowo, IPB gave a presentation on *The wisdom of Talang Community and the future they want*
- Dr. Jaenal Effendi / IPB gave a presentation on *The role of Islamic microfinance in poverty alleviation and environmental awareness*
- *The Ecology Seminar was held at the Department of Biology on February 17, 2014*

- Teja Tschardt / B09 gave a presentation On *Conservation in tropical agroecosystems: Biodiversity and ecosystem services*
- Yann Clough / Centre for Environmental and Climate Research, Lund University (associated to B09) gave a presentation on *Species traits as a linkage between arthropod communities and ecosystem services*

c. A workshop on *DNA Barcoding* was held at IPB on 29 November 2013 (<http://www.uni-goettingen.de/de/310995.html>).

- Fitri Yola Amandita / Z02 gave two presentations on *Field collection management* and *Choosing the primer and laboratory procedure for DNA barcoding material*



d. The international seminar *Ecosystem Restoration in the Tropics* was held at IPB on 28 November 2013 (<http://www.uni-goettingen.de/de/310995.html>).

- Jochen Drescher / Z02 gave a talk on *Contribution of science for managing transformed landscape ecosystems*

#### 4. News from Universities

1. Visit of the President of the Republic of Indonesia at IPB on December 20, 2013

##### IPB

- On occasion of the 50th anniversary of IPB, Dr. H. Susilo Bambang Yudhoyono – the President of the Republic of Indonesia and an alumnus of IPB – has visited Bogor Agricultural University. At the MiniExpo *IPB Research and Innovation* the President was also introduced to the CRC 990 – EForTS project (poster presentation, stand banner). A documentation of the visit is available by Green TV:

<http://greentv.ipb.ac.id/videos/orasi-ilmiah-presiden-ri-dalam-rangka-dies-natalis-emas-ipb-2/>).



Presentation of the CRC 990 – EForTS by Prof. Iskandar Siregar (Director Research and Innovation - DRI IPB, middle) accompanied by Dr Nurul Khumaida (Head of Research Agenda and Publication-DRI IPB, left) to the President of the Republic of Indonesia - Dr. H. Susilo Bambang Yudhoyono (right)

2. Visit of BMBF delegation at IPB on April 3, 2014

- On occasion of the meeting of the forum on *Science and Technology Cooperation with Indonesia* (WTZ) in Jakarta, a delegation of the German Federal Ministry of Education and Research – BMBF) headed by Mr. Metzger (Deputy Director General – European and International Cooperation and Member of the International Advisory Board of the University of Göttingen) visited IPB. Part of the meeting included a short presentation of the CRC 990.



## VI. News from Göttingen

### 1. RISE

#### **RISE Research Internships in Science and Engineering / a DAAD-DFG Cooperation** (<https://www.daad.de/rise/en/index.html>)

Doctoral Students have the opportunity to offer summer internships/research internships to undergraduate students from the United States, Canada and the UK in the fields of natural sciences and engineering.

Funds are made available from both DAAD and the CRC/DFG

The research internship proposed by **Siria Biagioni** – Doctoral student of the subproject A01 – on “*Holocene dynamics of tropical rainforest, climate, fire, human impact and land use in Sumatra, Indonesia*” has been positively confirmed. From June to August of this year Peter Meyer Reimer – a Biology / Ecology-graduate student from the Goshen College, Goshen, Indiana, USA will join Siria at UGoe. Within the CRC-EFForTS project Peter will carry out palynological (vegetation history) and charcoal analysis (fire history) on one sediment core from Jambi, Sumatra with the aims to (i) reconstruct past vegetation, plant diversity and climate dynamics at the study site in Jambi, Sumatra, to (ii) assess the

ecological responses of rainforests to environmental variability, and to (iii) investigate the history of human impact on the landscape (shifting cultivation, slash and burn, rubber and palm oil plantations).

### 2. CRC colloquia

In the summer semester 2014 a series of monthly interdisciplinary talks and discussions on the research of the young researchers and academics of group A, B, C and Z02 of the CRC 990 will be held at the Institute for Zoology and Anthropology.

#### Speakers and topics of 9 April:

- Claudia Dislich & Elisabeth Hettig / B10: *Modeling the socioeconomic and ecological functions in the tropics. An agent-based model of land-use change in Jambi, Sumatra*
- Andrew Barnes & Malte Jochum / B01: *Consequences of tropical land-use change for biodiversity-ecosystem functioning relationships in litter macro-invertebrate communities*

#### Speakers and topics of 7 May:

- Valentyna Krashevskaya / B08: *Paleo-environmental changes in Bukit Duabelas peatland during the last 7.000 years, inferred from testate amoebae community composition*
- Tom Kopp / C01: *Credit, Information and Remoteness: the Monopsonistic Competition between Rubber and Palm Oil Traders in Jambi Province, Indonesia*

#### Speakers and topics of 4 June:

- Kevin Darras/B09 & Vijesh Krishna/C07: *Bird trade in Jambi*
- Stefanie Steinebach/C02: *Cultural diversity and population dynamics in the Bukit Duabelas region*

#### Speakers and topics of 2 July:

- Martyna Kotowska/B04: *Above- and below-ground biomass, net primary productivity and carbon sequestration in lowland rainforest transformation systems in Sumatra*
- Evelyn Preuss / A05: *Trace gas fluxes from heavily weathered soils under rainforest transformation systems*

### 3. Workshops

A two day training workshop on “R” was held at the Institute for Zoology and Anthropology on April 7–8, 2014. **Andrew Barnes** and **Malte Jochum** – both doctoral students of B01 gave an introduction to the statistical software to Master and Doctoral students of the CRC. Further, own research data were applied to main important statistical tests and outcomes were discussed.

## VII. Cooperation

### Status of agreements of the CRC 990:

#### Signed:

MoA	UGoe – Indonesian University Consortium of the CRC (final version)
MoA / MoU	UNJA – National Park Bukit Duabelas
DEA	Data Exchange Agreement UGoe – Indonesian University Consortium of the CRC
MoA / MoU	Indonesian University Consortium of the CRC – PTPN VI
MoA	UNJA-National Park Bukit Duabelas – Suku Anak Dalam

#### Under preparation:

MoU	UNJA – BKSDA
MoA	Indonesian University Consortium of the CRC – BMKG
MoA	Indonesian University Consortium of the CRC – LIPI

MoA: Memorandum of Agreement

MoU: Memorandum of Understanding

### 2. Status workshop of the CRC 990

The second status workshop of the CRC 990 was held at Bogor and Jambi, Indonesia, on October 9–10, 2013 (<http://www.uni-goettingen.de/de/crc-status-workshop-october-2013/444571.html>).

The aim of the status workshop was to foster the scientific collaboration between the Indonesian University Consortium and the University of Göttingen. On the first day of the conference at Bogor achievements of the project were highlighted by the speakers (Prof. Scheu, Prof. Fauzi). At the subsequent signing ceremony the Memorandum of Understanding with PTPN VI – a government-owned oil palm plantation company – was concluded. Focus of the second day in Jambi was placed on consolidating the research focal points of the groups A, B, C and Z02 (presentations and working group discussions).

The status workshop was attended by high-ranking representatives of the Indonesian government and the German Embassy.



Representatives of the CRC after signment of the MoA with PTPN VI and the Agreement of Data Exchange within the consortium.

From left to right:

Prof. Yonny Kusmaryono (Vice Rector Academic and Student Affairs IPB), Prof. Muhammad Basir (Rector Tadulako University), Mr. Ahmad Nasulian Arifin (Director of Planning and Development PTPN VI), Prof. Herry Suhardiyanto (Rector IPB), Prof. Zulkarnain (Vice Rector IV Jambi University), Prof. Zainuddin Basri (Vice Rector IV, Tadulako University), Mr. Michael Rottmann (Science Attaché, German Embassy, Jakarta), Prof. Reiner Finkeldey (Vice President Research, UGoe), Prof. Anas M. Fauzi (Vice Rector, Research and Collaboration IPB & Speaker CRC990/EFForTS Indonesia Consortium), Prof. Stefan Scheu (Speaker CRC990/EFForTS UGoe), Prof. Hermanto Siregar (Vice Rector, Resource and Strategic Issue Studies IPB).



## VIII. Announcements / Boards of the CRC

1. Extended Management Board at UGoe
  - A change of the board / group B representative took place. Holger Kreft was elected as successor to Uli Brose.
2. Monitoring Team "Convention on Biological Diversity (CBD)"
  - IPB: Damayanti Buchori and Anas Fauzi
  - UNJA: Bambang Irawan
  - UNTAD: Aiyen Tjoa
  - LIPI: Prof. Endang Sukara
  - UGoe: Stefan Scheu and Jochen Drescher
3. Board Publication Policy
  - UGoe: Edzo Veldkamp (Chair German side), Kerstin Wiegand, Martin Qaim
  - IPB: Iskandar Z. Siregar (Chair Indonesian side)
  - UNJA: Zulkifli Alamsyah
  - UNTAD: Henry Barus
4. Speaker Group B
  - Teja Tschardt (B09) has been elected as speaker of group B.

## IX. Outlook / Up-coming Events 2014

May 8–9	<b>The 4th Retreat of the CRC 990 in Göttingen</b>
June	<b>International Workshop on "Implementation of the Convention on Biological Diversity (CBD) and the Nagoya Protocol in Indonesia" at IPB, Bogor, Indonesia</b>
August	<b>Visit of the President of the University of Göttingen – Prof. Dr. Beisiegel – at IPB, Bogor, Indonesia</b>
October 8–10	<b>3rd Status Workshop in Jambi</b>



Georg-August-Universität Göttingen (UGoe)



Institut Pertanian Bogor (IPB)



Universitas Jambi (UNJA)



Universitas Tadulako Palu (UNTAD)

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