CRC 990

First (!) status report

Stefan Scheu

Speaker

Idea of CRC 990

Establish knowledge on ecological and socioeconomic functions and trade-offs

to

protect and enhance
ecological functions and human welfare

➔ *Collaboration between and integration of natural and socioeconomic sciences*

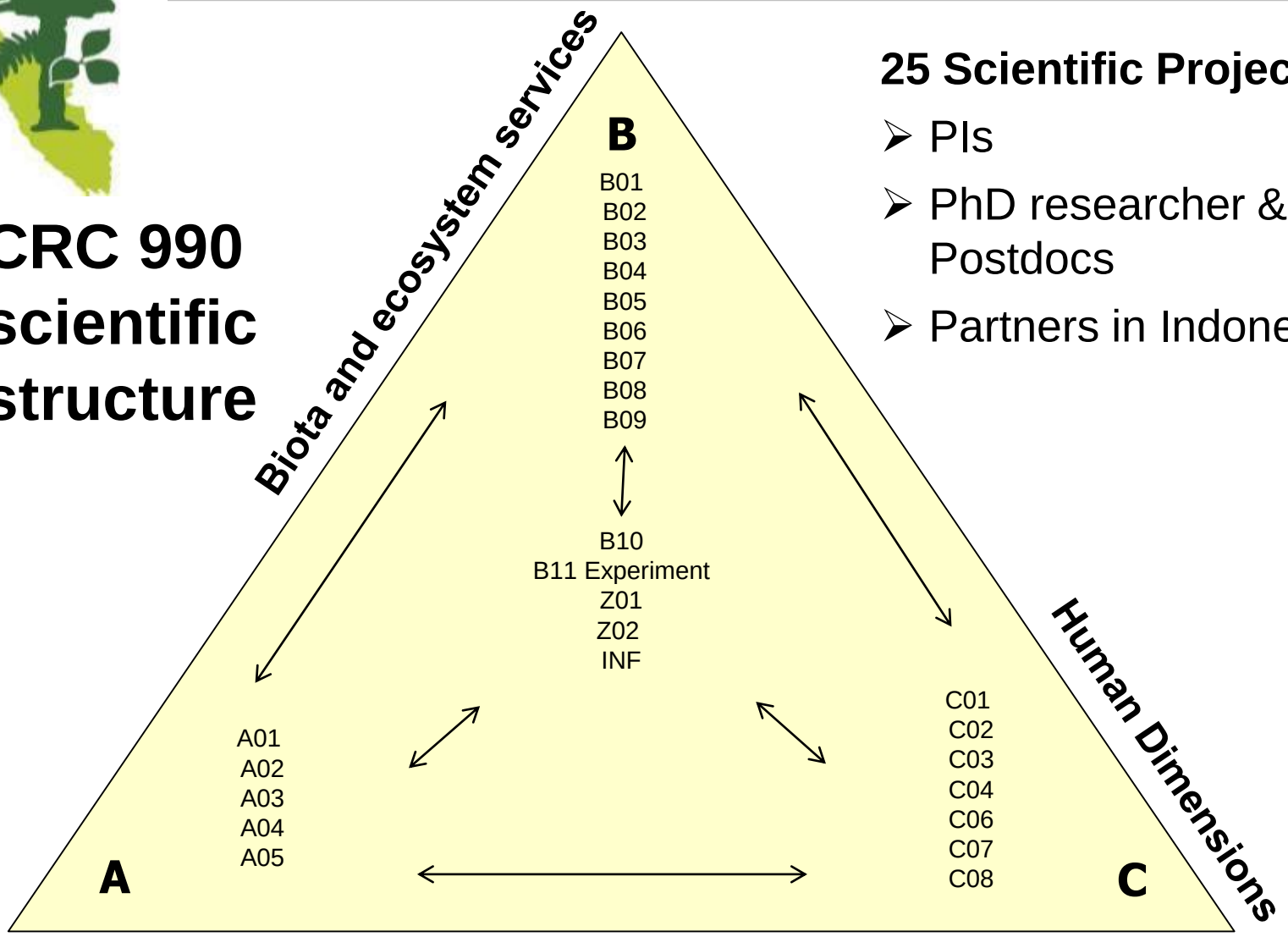
➔ *Reconciling conservation and human needs*

Binational cooperation on basic research and higher education

- **Main cooperation partners**
  - Bogor Agricultural University (IPB)
  - Jambi University (UNJA)
  - Tadulako University Palu (UNTAD)
- **Main research output**
  - Basic science knowledge
  - Publications
- **Main dates**
  - Start of project January 2012
  - Kickoff meeting June 2012
  - Start of field work August 2012
  - End of (current) funding December 2015
  - Potential of funding until 2023

CRC 990 "Ecological and socioeconomic functions of tropical lowland rainforest transformation systems (Sumatra, Indonesia)"

CRC 990 scientific structure

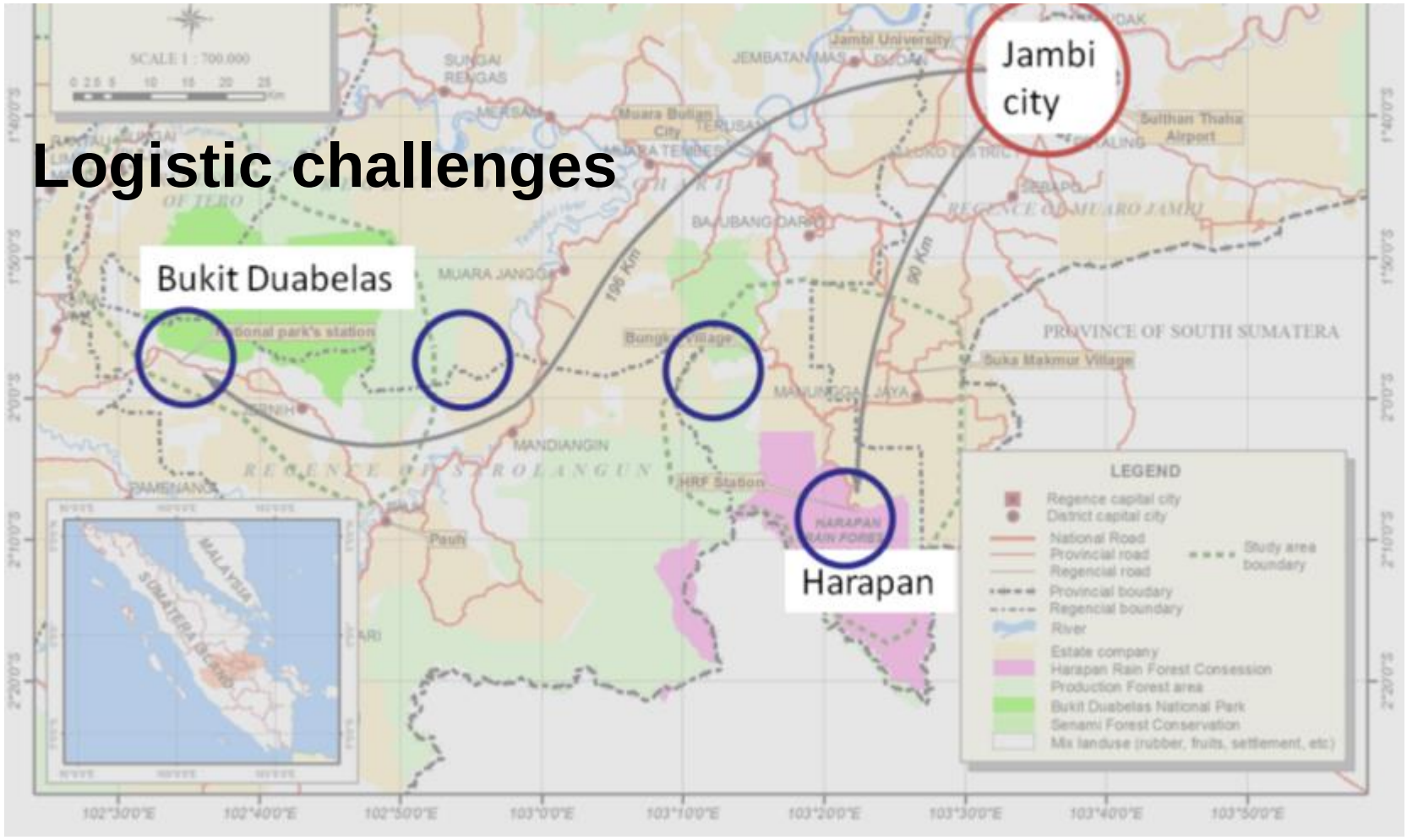


25 Scientific Projects:

- PIs
- PhD researcher & Postdocs
- Partners in Indonesia

1 core station: logistic basis with office, staff, accommodation, cars ...
4 field hubs: basic infrastructure accommodation, electricity, motorcycles ...

Logistic challenges



Z01 Status update

Team: S. Scheu, K. Wiegand, M. Qaim
A. Fauzi, I.Z. Siregar, M. Agil, Zulkarnain, Zainuddin Basri

- **Science administration**
  - Office management IPB, UNJA and UGoe
  - Infrastructure (housing, field hubs, lab, vehicles)
- **Science management**
  - Agreement and permits
  - Boards of CRC
- **Science communication**
  - Data bank and Mirror server
  - Website
  - Circulars & Infosheets
  - Newsletter

Z01 - Science administration

Office Göttingen

Barbara Wick (coordination)

Ms Ivonne Hein (secretariat)

Ms Claudia Nothnick
(central finacial administration)

Ms Heidrun Königsmann
(human resources department)

Ms Hella Krumsiek
(central financial administration)

Z01 - Science administration

Office Bogor

IPB

Wolfram Lorenz (Managing Coordinator)

Ms Mira Kartikasari (Finances)

Ms Traya Soegiarso (Permits)

Mr Hadi Sujana (Driver)

Stephanie Wessling
(Assistant to Coordinator)

Z01 - Science administration

Office Jambi

UNJA

Dr. Bambang Irawan (Coordination Head Office)

Ms Rizky Febrianti (assistant to coordinator)

Ms Megawati Syafni (permits)

Mr Yuking Linatra (logistics)

Mr Muhammad Fahrozi (finances)

Ms Dwi Maya Azwir (lab technician)

Mr Junaidi and Mr Epriansyah (drivers)

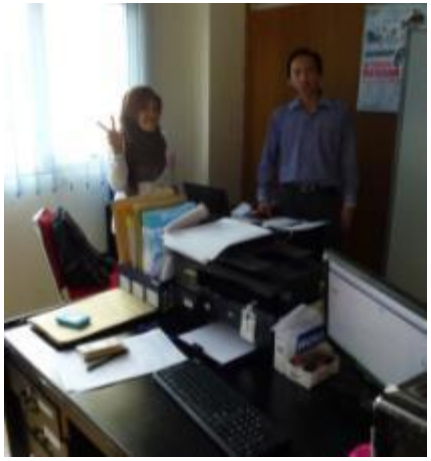
Pak Usman and Pak Armanto (plot manager Harapan & Bukit Duabelas regions)

Z01 - Science administration

Office & laboratories

UNJA

2 floors operating, third floor under renovation



Field labs at National Parks Bukit Duabelas & PT Humusindo

Planned / under construction

Z01 - Science administration

Housing

Bogor

- 2 rooms at International Guest House IPB

Jambi

- 4 Group Houses for researchers in Jambi city
- 2 Guest houses at UNJA campus:
  - Mess F
  - Mess BKS Barat: under construction

Z01 - Science administration

Field hubs

- Batu Kucing
  - 1 house in use
  - 1 house under construction
- Matang Kabau / National Park
  - Status: minor renovation
- Muara Bulian
  - Status: minor renovation
- PT Humusindo
  - Planned

Z01 - Science administration

Vehicles

3 cars

Bogor: one regular car for town

Jambi: one 4WD for field and shuttle service,
one regular car for Jambi town

22 motorbikes

Z01 - Science management

Agreements (MoA / MoU)

- Too many to list: documented by Pak Anas

Boards CRC

- Joint Management Board & Advisory Board
- Data Management Board
- Plot Management Team
- Monitoring Team Convention on Biological Diversity

Z01 - Science management

Data exchange / Information

The information systems EFForTS-IS has been launched

Mirror server established at LIPI

More later by Tim Ritter

Z01 - Science communication

Website

Circulars and Infosheets (so far 8 & 69)

Internal

Monthly, status update on science administration

Newsletter (first August 2013!)

External & internal

Quarterly

Status update / publication of science management and synopsis of research results

Scientific staff, administration in research management and DFG sponsors

Z02 Status update

Monitoring of meteorological data

Monitoring canopy arthropod biodiversity

Z02 (CSSU)

Barcoding vascular plants

Implementation of ABS measures

Z02: Monitoring meterological data

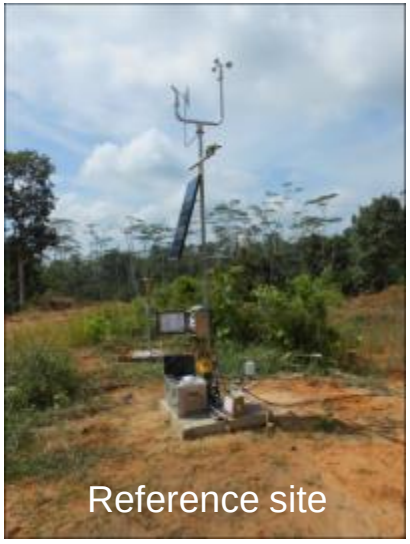
Team: A. Knohl, O. Panverov, A. Meijide, M. Tölle, A. Rauf, P. Irianto, H. Junedi, D. Gunawan

Aim: Provide meteorological data from study sites

Status

- Meteo stations at core sites installed and running since June/July 2013
  - Air temperature, relative humidity, soil temperature, soil moisture (hourly measurements)
- Meteo stations at reference sites and UNJA running since May/June 2013
  - Wind speed, wind direction, net radiation, PAR, short wave radiation, air temperature, relative humidity, soil moisture, soil temperature, rainfall, air pressure, soil heat flux (every 10 min.)
- Data available for all CRC 990 members
  - Preparation of automatic check for data quality
  - Data available through INF project, currently on request

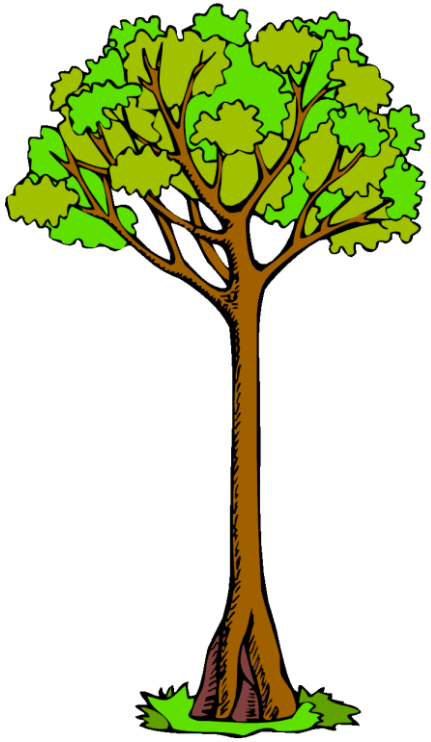

Core site


Reference site

Z02 - Monitoring canopy arthropod diversity

Team: S. Scheu, J. Drescher, D. Buchori, B. Irawan, R. Ubaidilah

Aim: Provide overall diversity data on canopy arthropods



Bulk of life in forests systems in the canopy

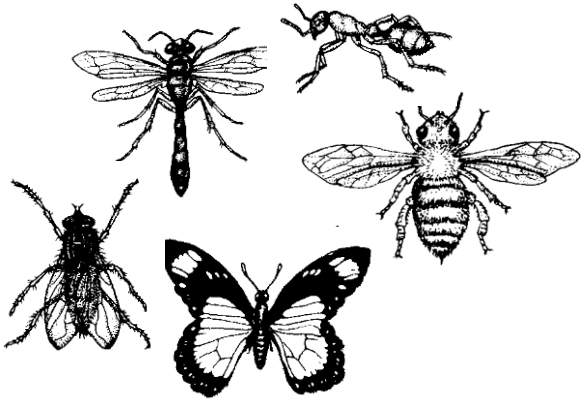
pollination

seed dispersal

herbivory

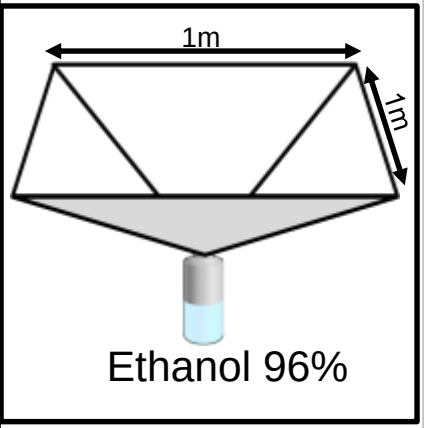
frugivory

disease vectors



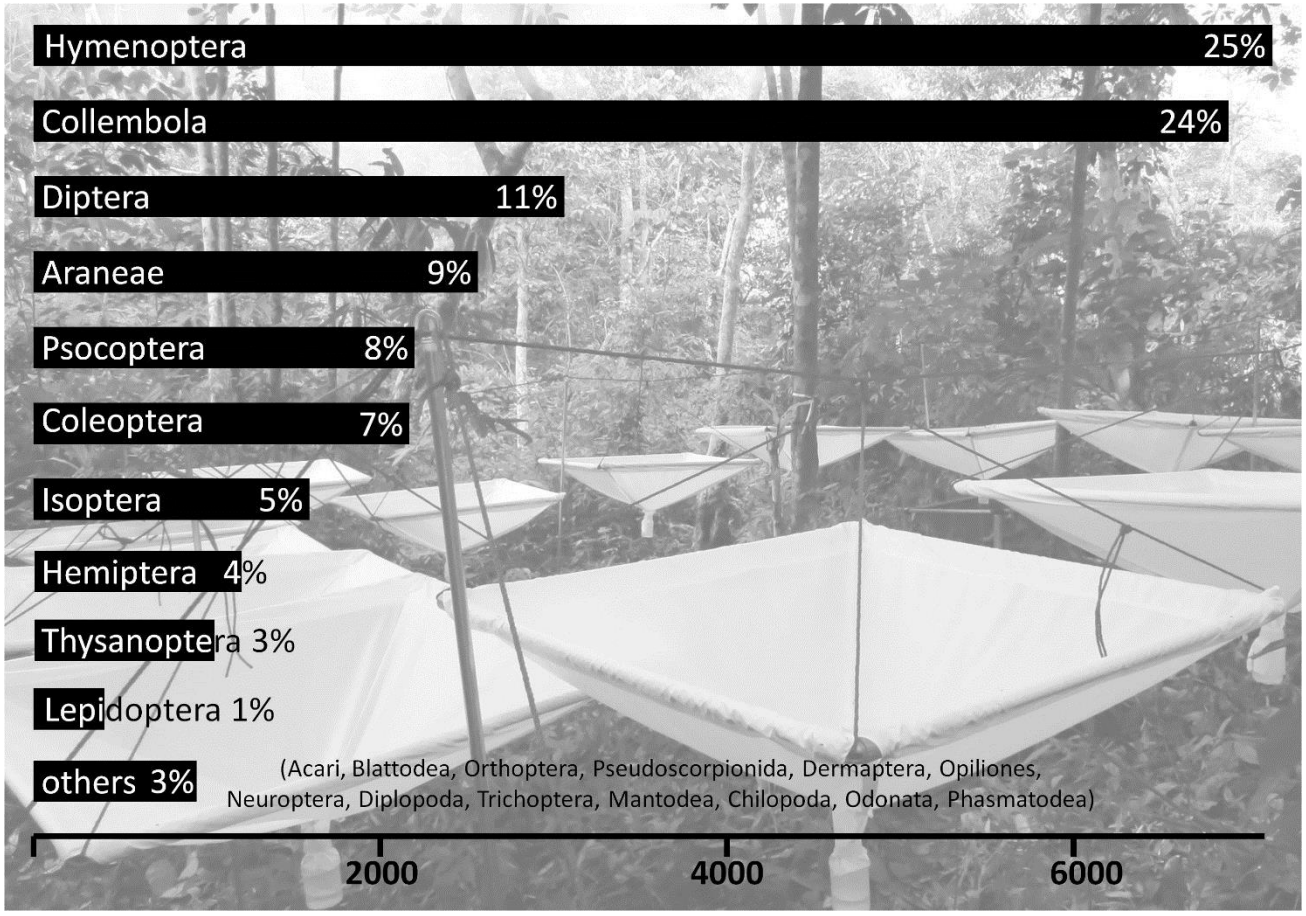
Z02 - Monitoring canopy arthropod diversity

16 traps/replicate



Canopy fogging

Z02 - Monitoring canopy arthropod diversity



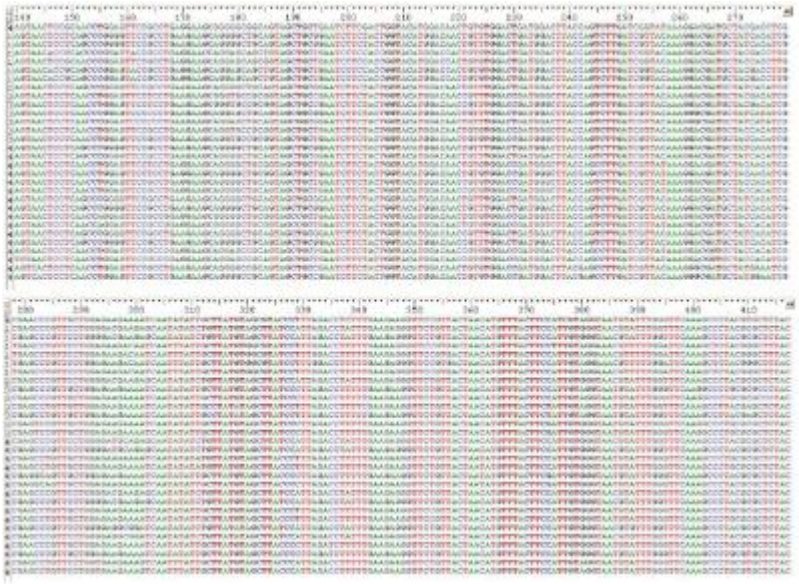
Specimens of 6 plots identified to order level, N=27.275

Z02 – Barcoding of vascular plants

Team: R. Finkeldey, H. Kreft, I.Z. Siregar, S. Rahayu, F.Y. Amandita, K. Rembold, B. Vornam

Aim: Provide tools for genetically identify plant species

Identification



Barcoding

Z02 – Barcoding of vascular plants

Current status

Field work

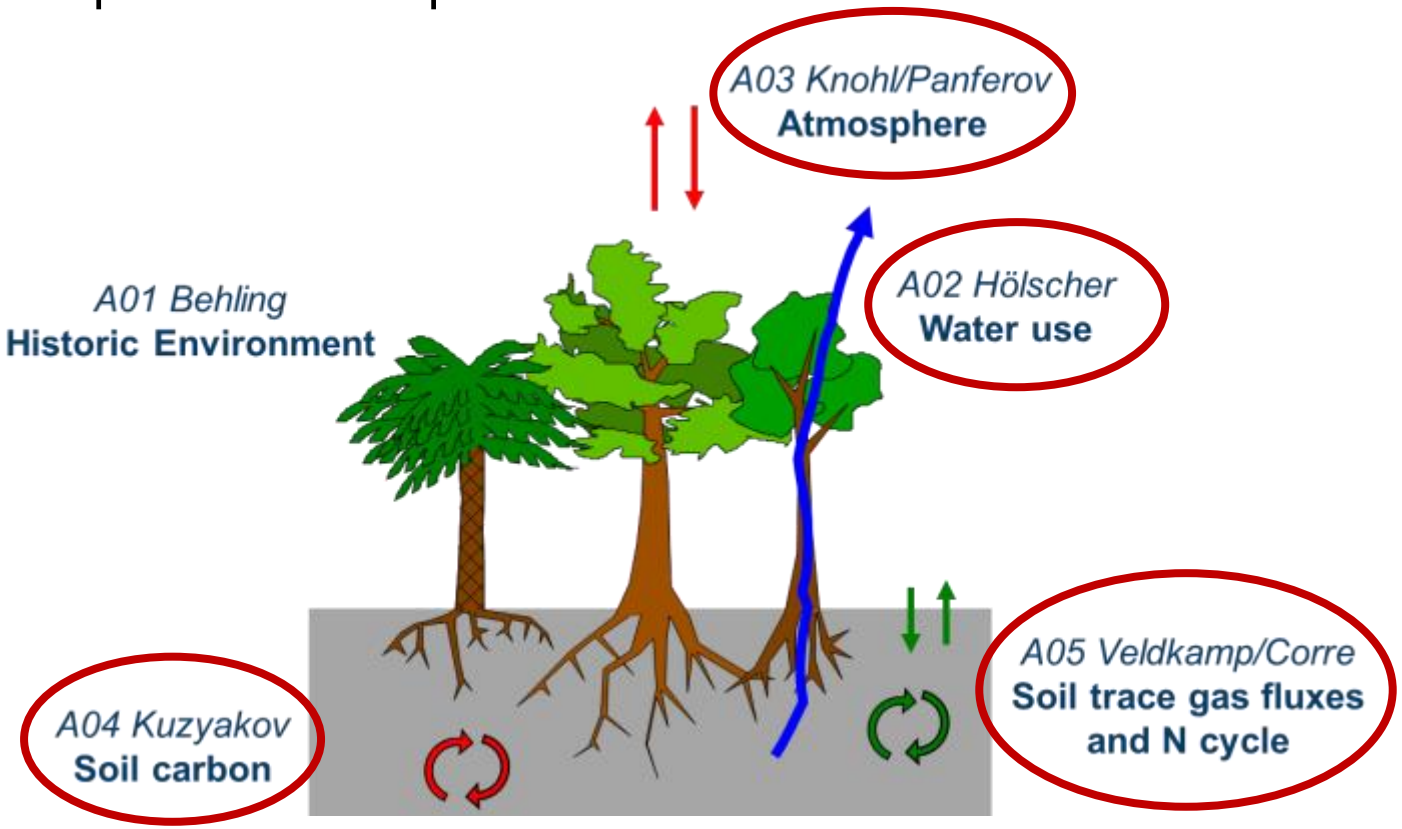
- >1.600 leaf samples collected

Laboratory work

- DNA extraction from 292 leaf samples (189 species)
  - rbcL successful rate high (>99%)
  - matK successful rate lower (>84%)

Group A : Environmental processes

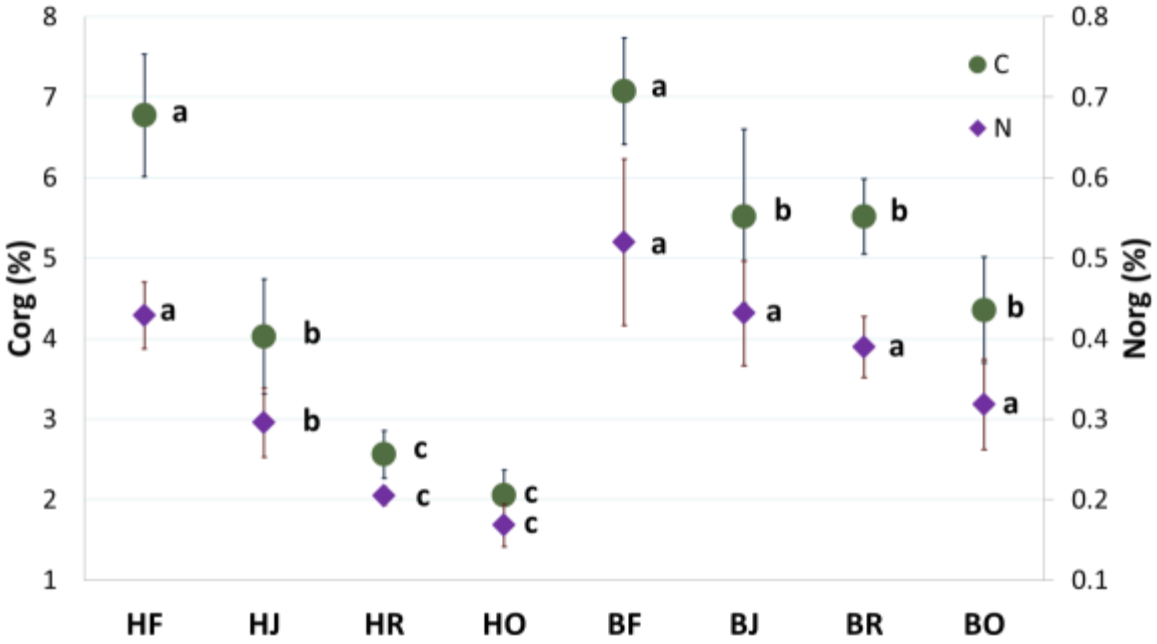
Aim: To investigate the effects of land transformations on environmental processes in soil, water and atmosphere at multiple spatial and temporal scales



A04 - Soil carbon

Team: Y. Kuzyakov, K. Murtilaksono, M. Damris, T. Guillaume

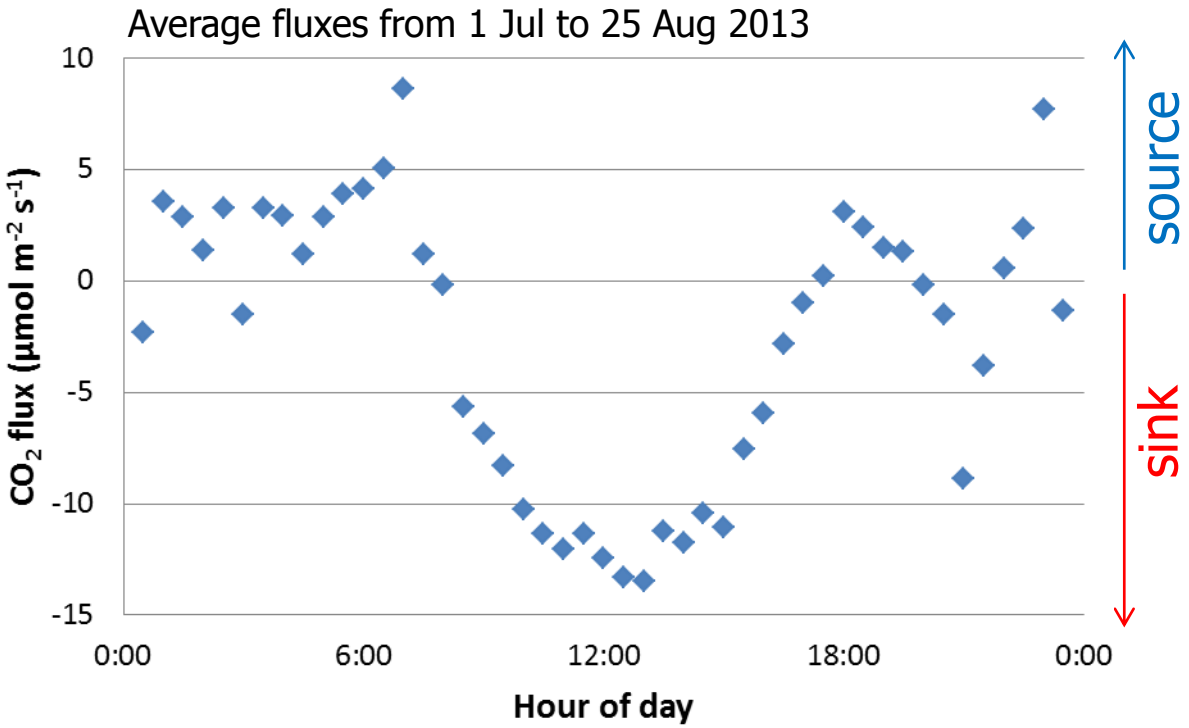
C_{org} and N_{org} (%) in A horizon



- Significant effect of land use on C_{org} and N_{org} in top soil
- C and N (%) of topsoil significantly decrease with land use intensity

A03 - CO_2 fluxes of oil palm plantation

Team: A. Knohl, O. Panferov, T. June, Irianto, H. Junedi, A. Rauf, D. Gunawan, M. Herbst, A. Meijde, M. Tölle

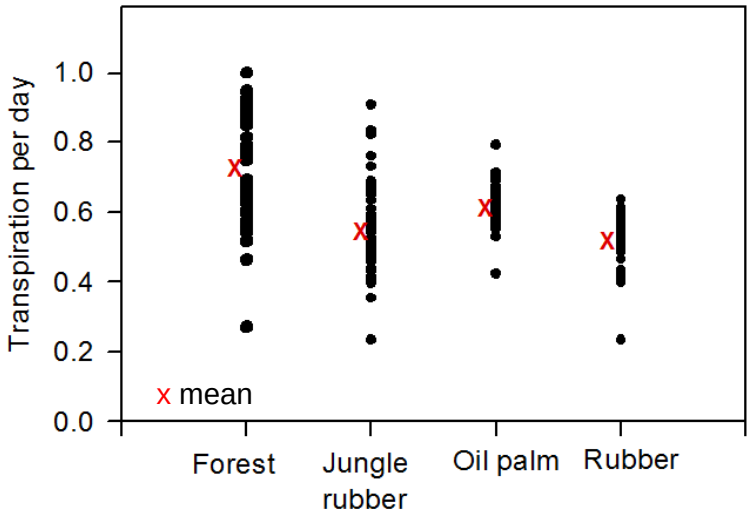


- Young oil palm plantation (2 years) is a moderate C sink of about 2.5 g C m^{-2} day^{-1} for CO_2 in July and August.

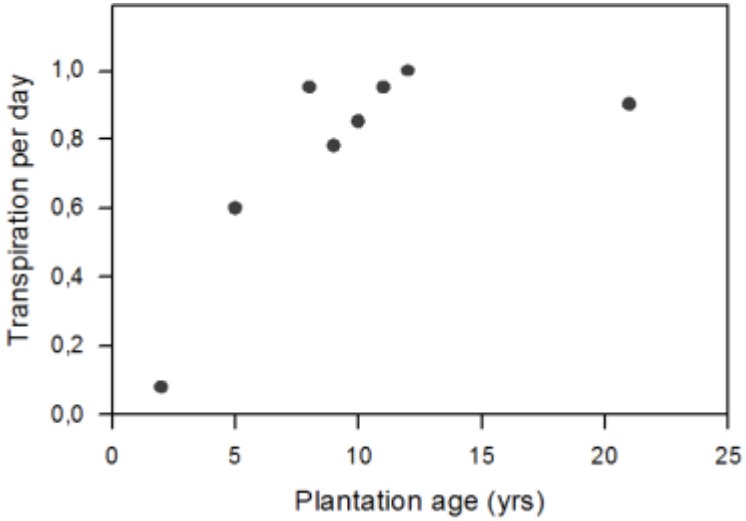
A02 - Water use

Team: D. Hölscher, H. Agusta, Hendrianto, H. Junedi, A. Roell, A. Hanf, N. Furong, A. Hardanto

Four systems, stand level transpiration (normalized, 50 days)



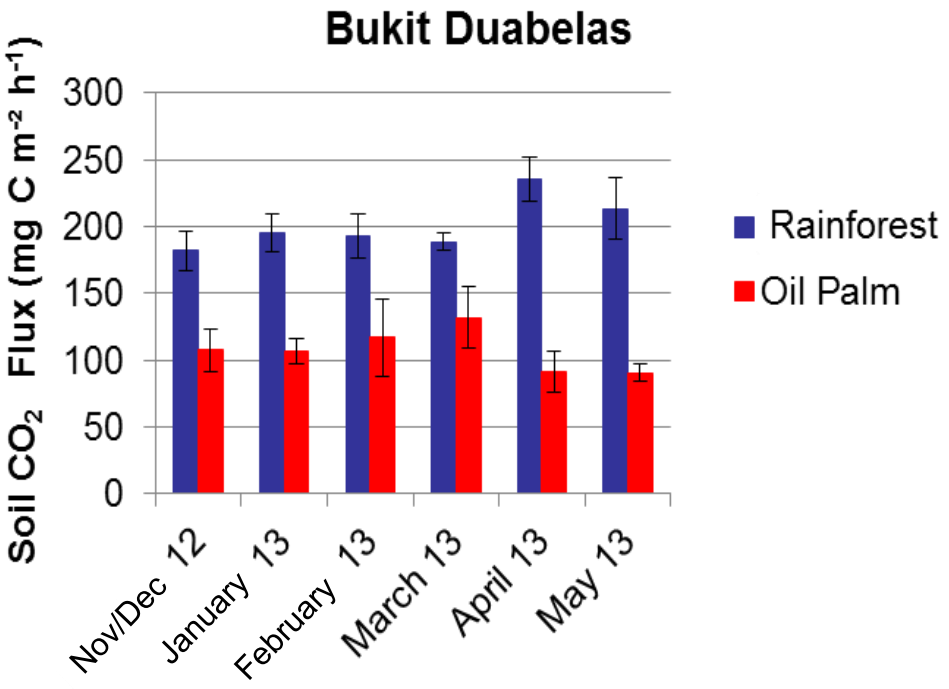
Oil palm, stand level transpiration (normalized) over age



- High temporal variation and high maximum values in forest and jungle rubber
- High variation at the landscape level in oil palm due to age class structure

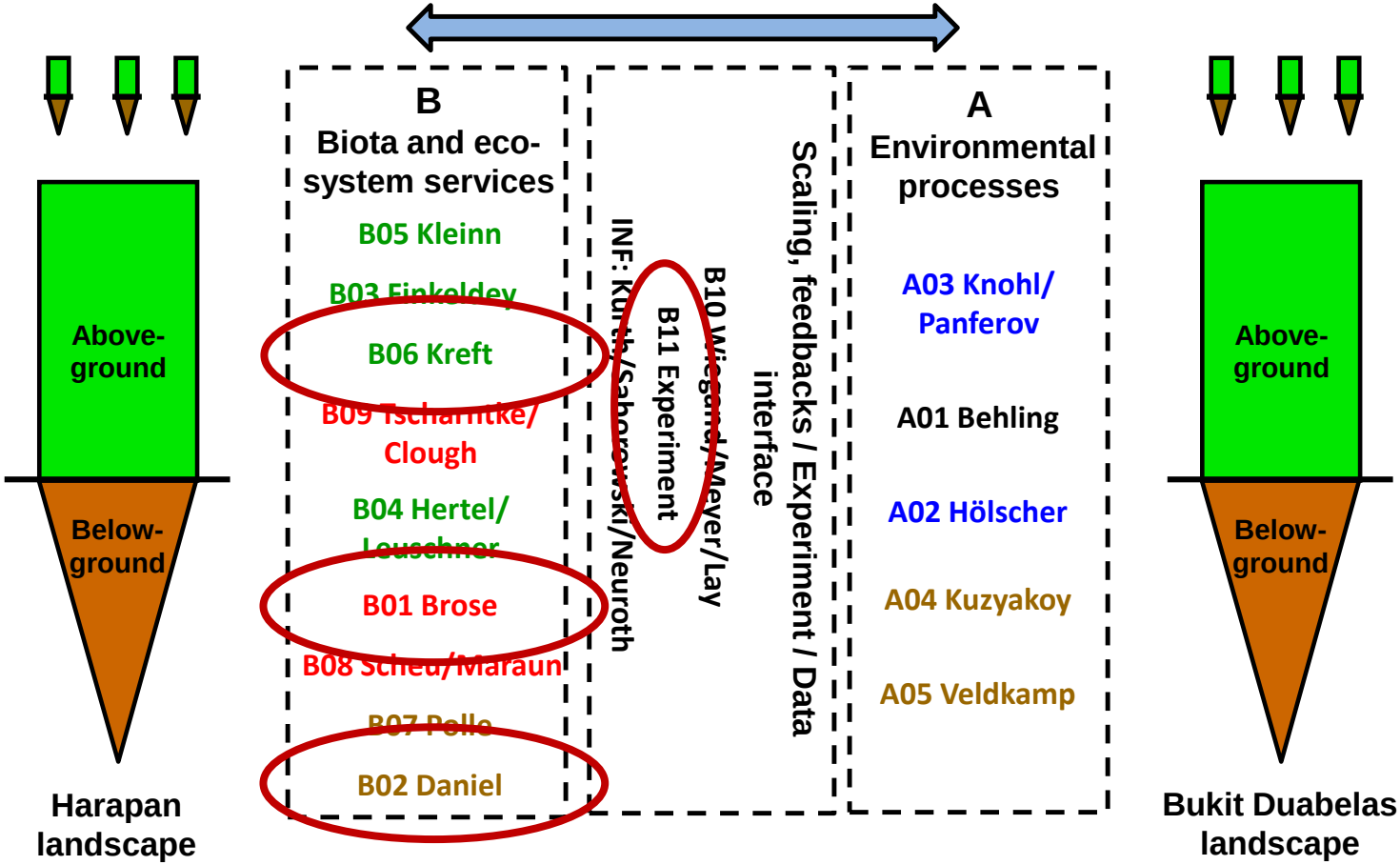
A05 - Soil trace gas fluxes

Team: M.D. Corre, E. Veldkamp, S.R. Utami, A. Tjoa, M. Damris, I. Rusmana, K. Allen, E. Preuß, S. Kurniawan



- Small seasonal variation in soil CO_2 efflux rates
- Smaller soil CO_2 efflux rates in oil palm compared to forest

B – Biota and ecosystem services



B02 - Metagenomic and metatranscriptomic analysis soil microbial communities

Lowland rainforest

Jungle rubber

Rubber plantation

Oil palm plantation

Isolation of soil DNA

Isolation of soil RNA

Creation of DNA libraries/ Direct PCR

16S rRNA gene analysis (Bacteria-Archaea)

Generation of cDNA (mRNA and rRNA anlysis)

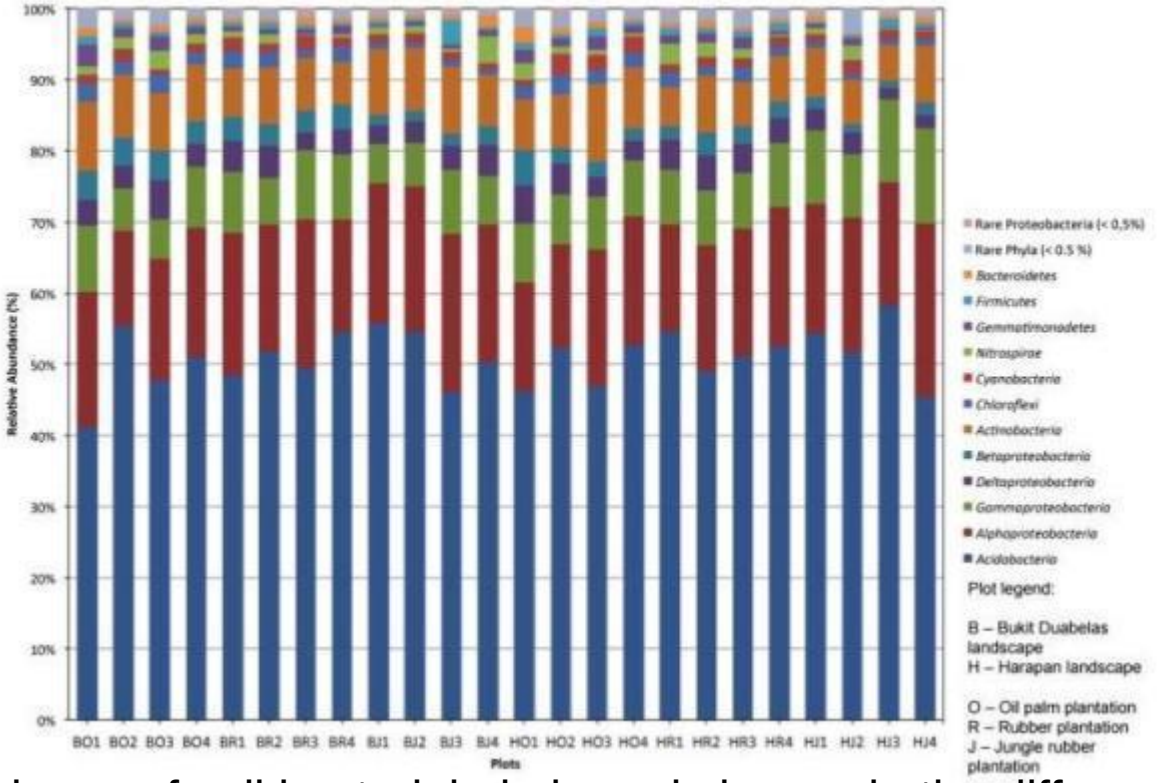
Screening and detection of functions (N cycle)

Phylogenetic diversity of the entire community

Functional diversity/ diversity active community

B02 - Metagenomic and metatranscriptomic analysis soil microbial communities

Team: R. Daniel, N. Mubarik, A. Meryandini, M. Engelhaupt



Relative abundance of soil bacterial phyla and classes in the different land use systems (analysis based on 500,000 16S rRNA gene sequences)

B01 - Structure, stability and functioning of macro-invertebrate communities

Team: U. Brose, A. Farajallah, T.H. Widarto, N.F. Haneda, A. Barnes, M. Jochum

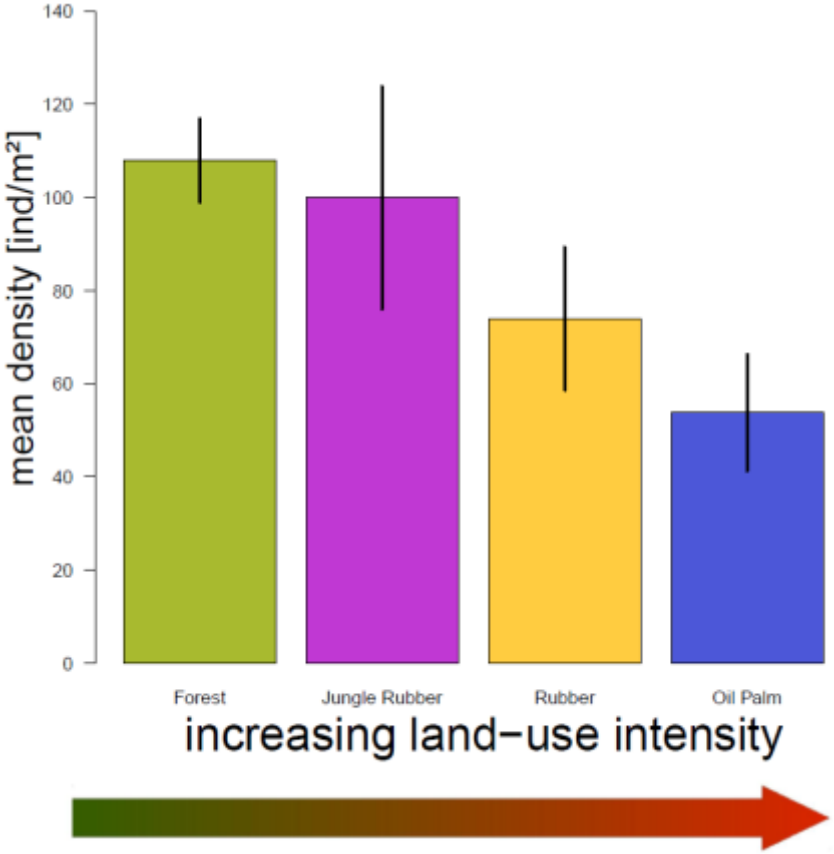
Current status

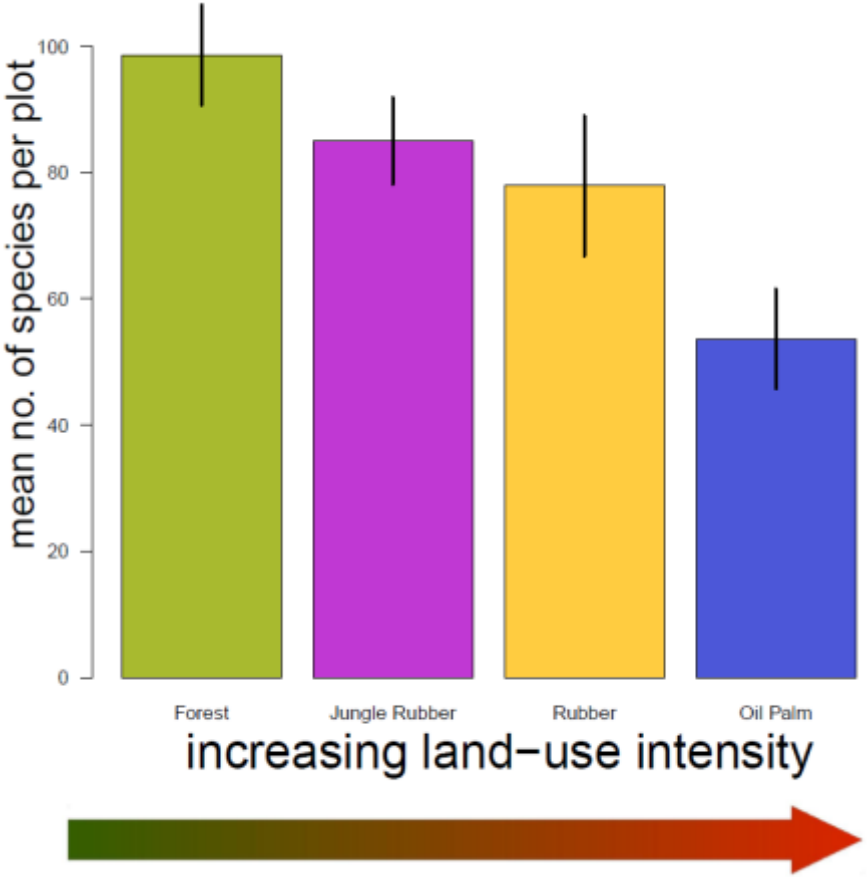
- Animal sampling of all 32 plots completed
- Animals sorted into major groups and morphospecies
- Stable isotope and stoichiometry analyses – export permit not yet granted ➔food-web analyses delayed




B01 - Structure, stability and functioning of macro-invertebrate communities

8058 individuals from 925 morphospecies (30 orders, 187 families)





B06 – Plant diversity

Team: H. Kreft, S.S. Tjitrsoedirdjo, B. Haryadi, J.C. Sulistiangsih, K. Rembold

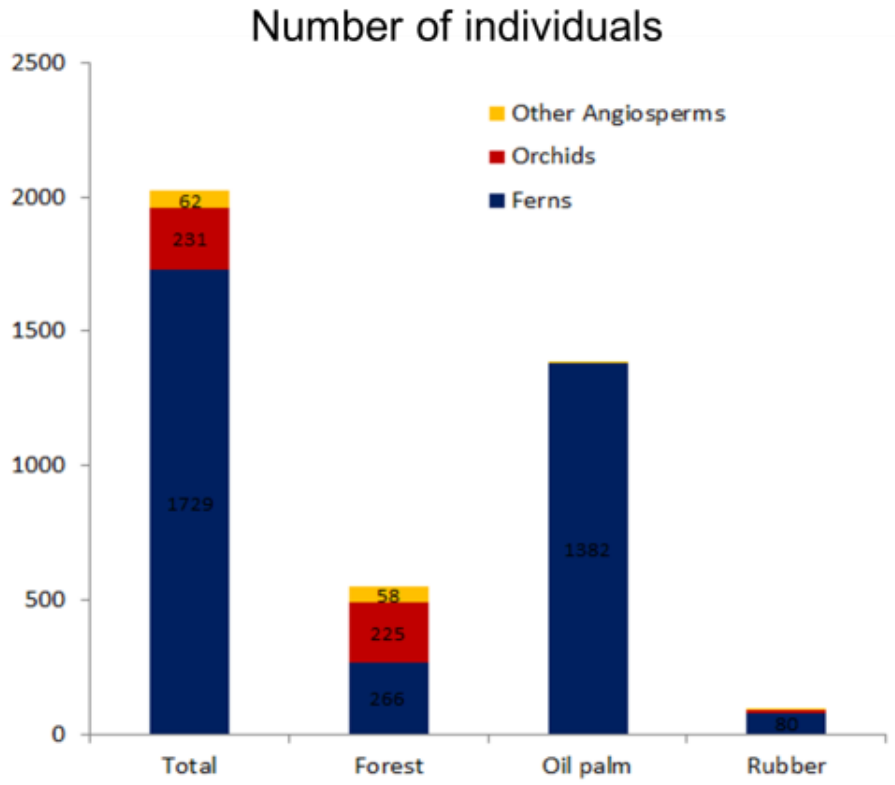
Current status

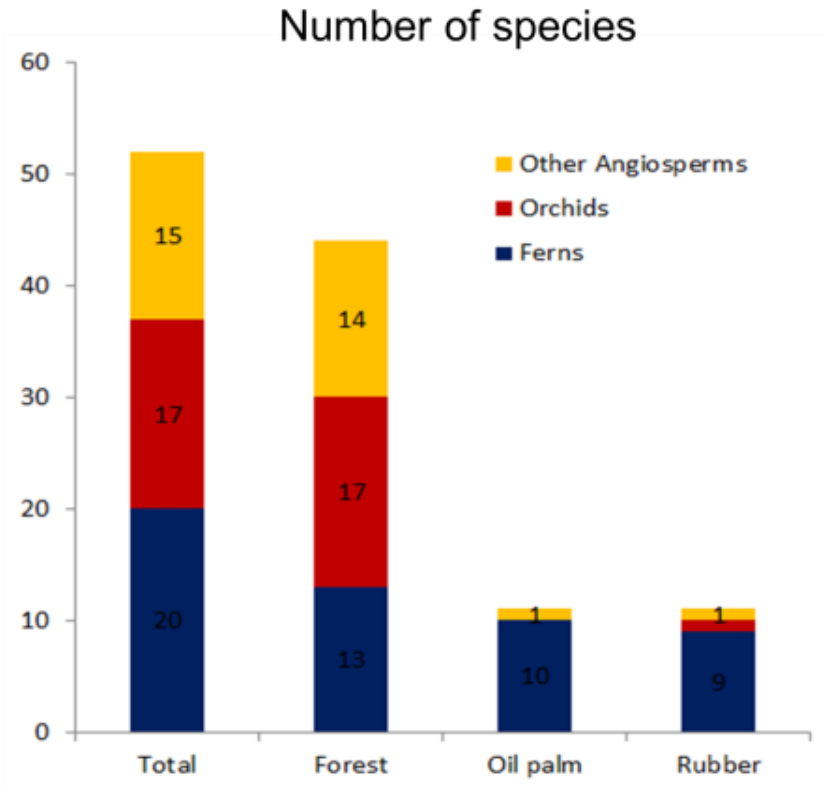
- ~1800 herbarium specimen of ~625 species collected for identification
- Trees of BR1-4, BO2-4, BF3-4 measured (structure & position)
- Plants of subplots BR1-4, BO2-4, BF3-4 counted and measured (height)
- ~20.000 plant pictures for online identification and field guides

Inventorying of all plots to be completed in August 2014

B06 – Plant diversity

Epiphytes





- Epiphyte abundance is high but diversity is low in oil palm plantations

B11 - Biodiversity enrichment in oil palm plantations: ecological and socio-economic impacts

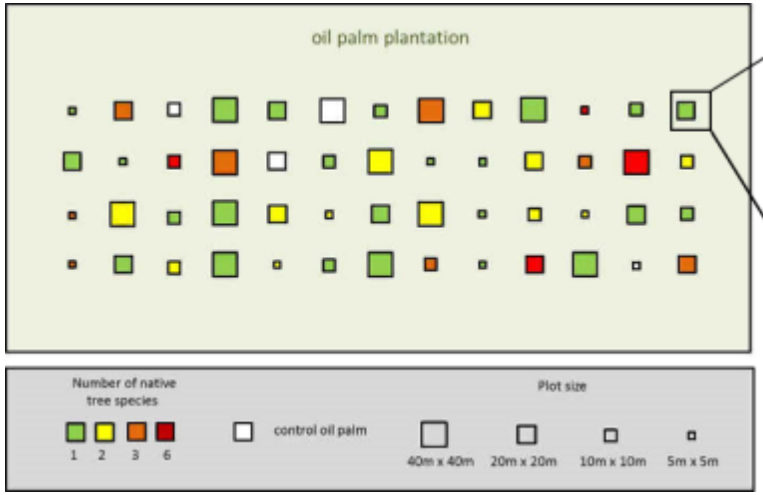
Team: H. Kreft, U. Brose, D. Hölscher, Y. Clough, M. Wollni, Hendrayanto, L. Sundawati, P. Pamoengkas, B. Irawan, Rosyani, A. Tjoa, M. Treuscher, A. Gerard, M. Vorläufer

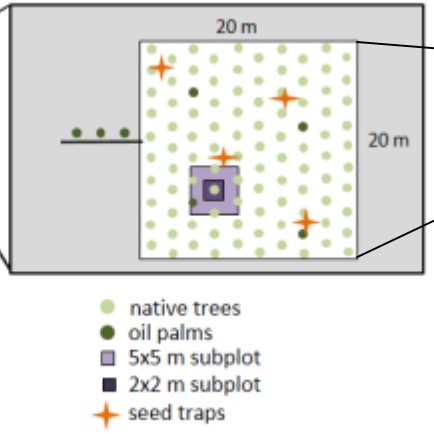
Objectives

- To increase the biodiversity within an oil palm plantation by planting “tree islands”
- To find out how enrichment planting affects
  - ecosystem functioning
  - plant & animal diversity
  - the productivity of oil palms

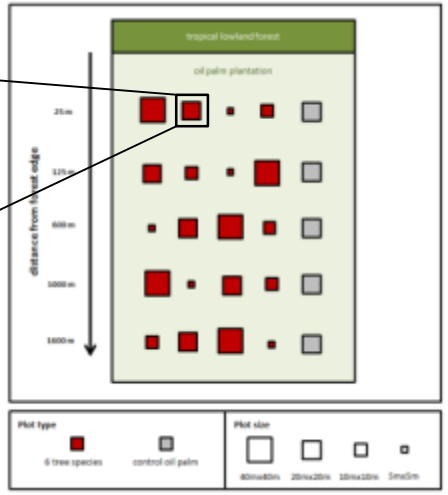
B11 - Biodiversity enrichment in oil palm plantations …

PT Humusindo





PTPN VI



Variation of plot size and species diversity level

- Number of plots: 52
- Plot sizes: 40 x 40 m ➔ 5 x 5 m
- Species diversity levels: 1, 2, 3, 6

Variation of plot size and distance to forest

- Number of plots: 25
- Plot sizes: 40 x 40 m ➔ 5 x 5 m
- 6 species per plot

Group C: Human dimension

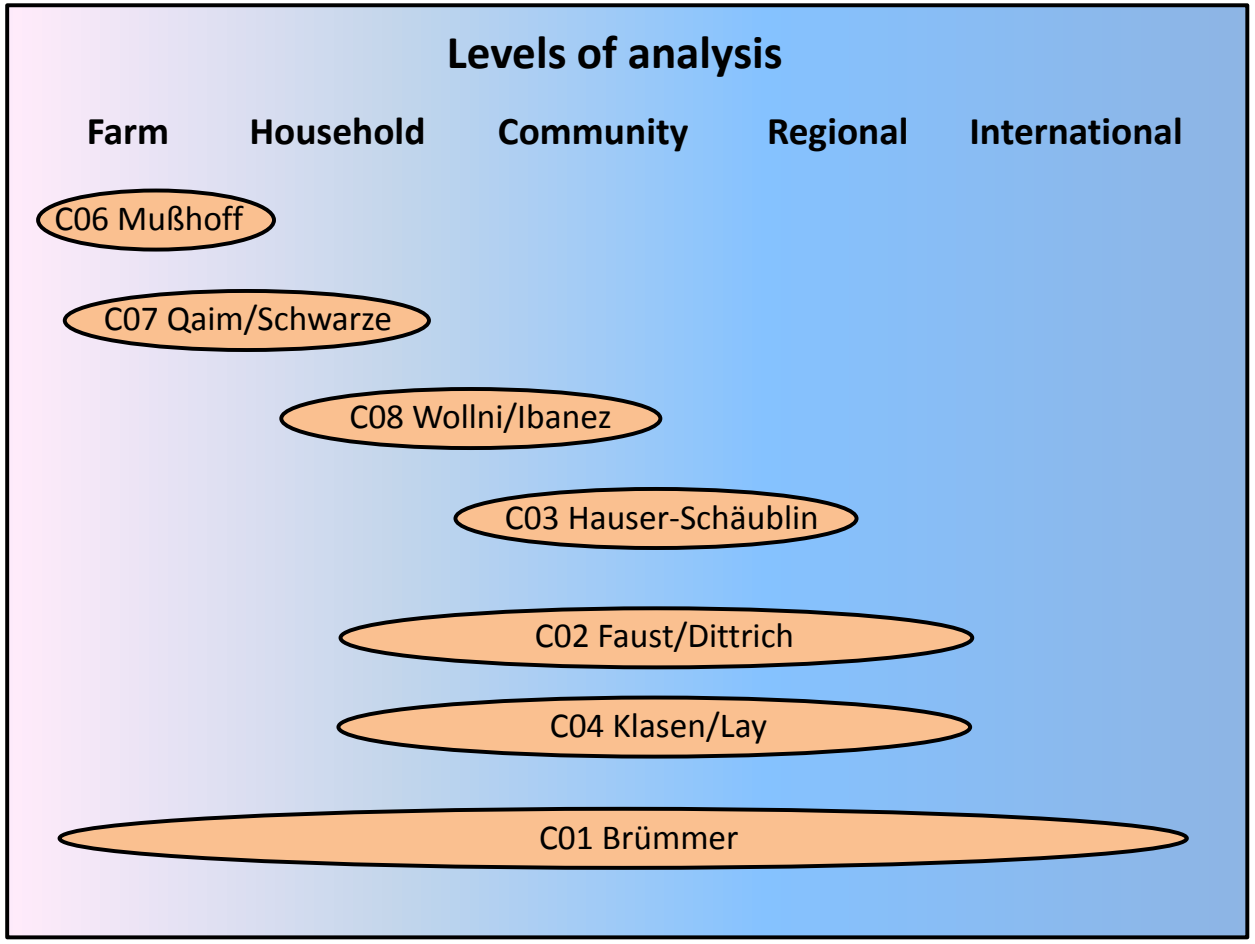
Team: B. Brümmer, C. Dittrich, H. Faust, B. Hauser-Schäublin, M. Ibanez, S. Klasen, J. Lay, O. Mußhoff, M. Qaim, M. Wollni, S. Adiwibowo, Z. Alamsyah, E. Amzu, D. Denmar, N. Dompak, Z. Fathoni, B. Juanda, D.B. Hakim, M. Mappatoba, N. Nuryartono, R. Oktaviani, Rosyani, H. Siregar, E. Soetarto, T. Sumarti, D. Surhajito, Y. Syaukat, B. Beckert, M. Euler, M. Gatto, J. Hein, A.M. Holtkamp, T. Kopp, V. Krishna, I. Kunz, S. Moser, S. Steinebach, K. Trapp, M. Vorläufer

Overarching questions

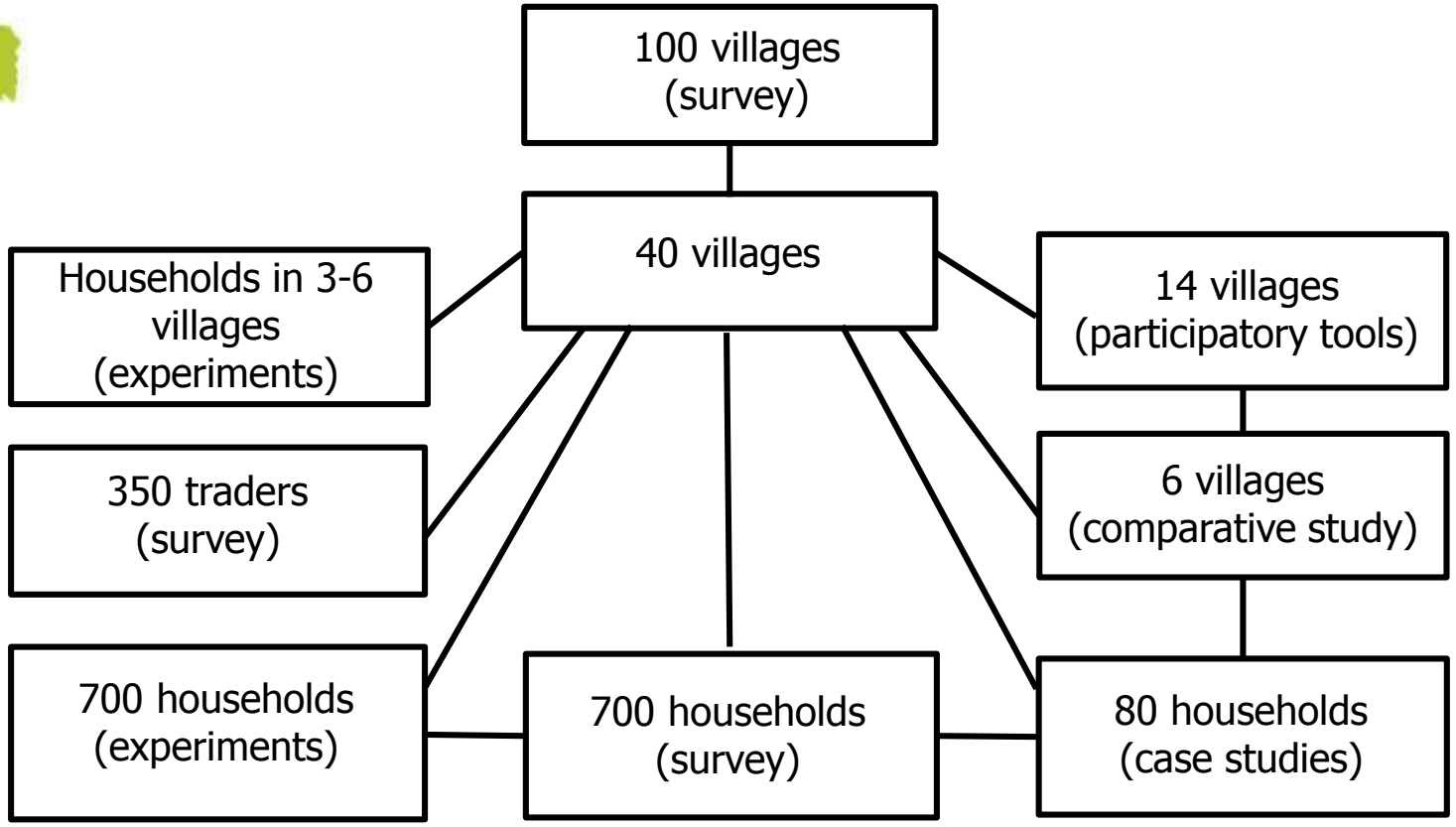
1. **Driving forces:** What are socioeconomic determinants of observed land use changes?
2. **Impacts:** What are socioeconomic impacts and trade-offs of different land use systems?
3. **Policy implications:** How can more sustainable land use systems be designed and implemented?

Group C: Human dimension

Structure of projects



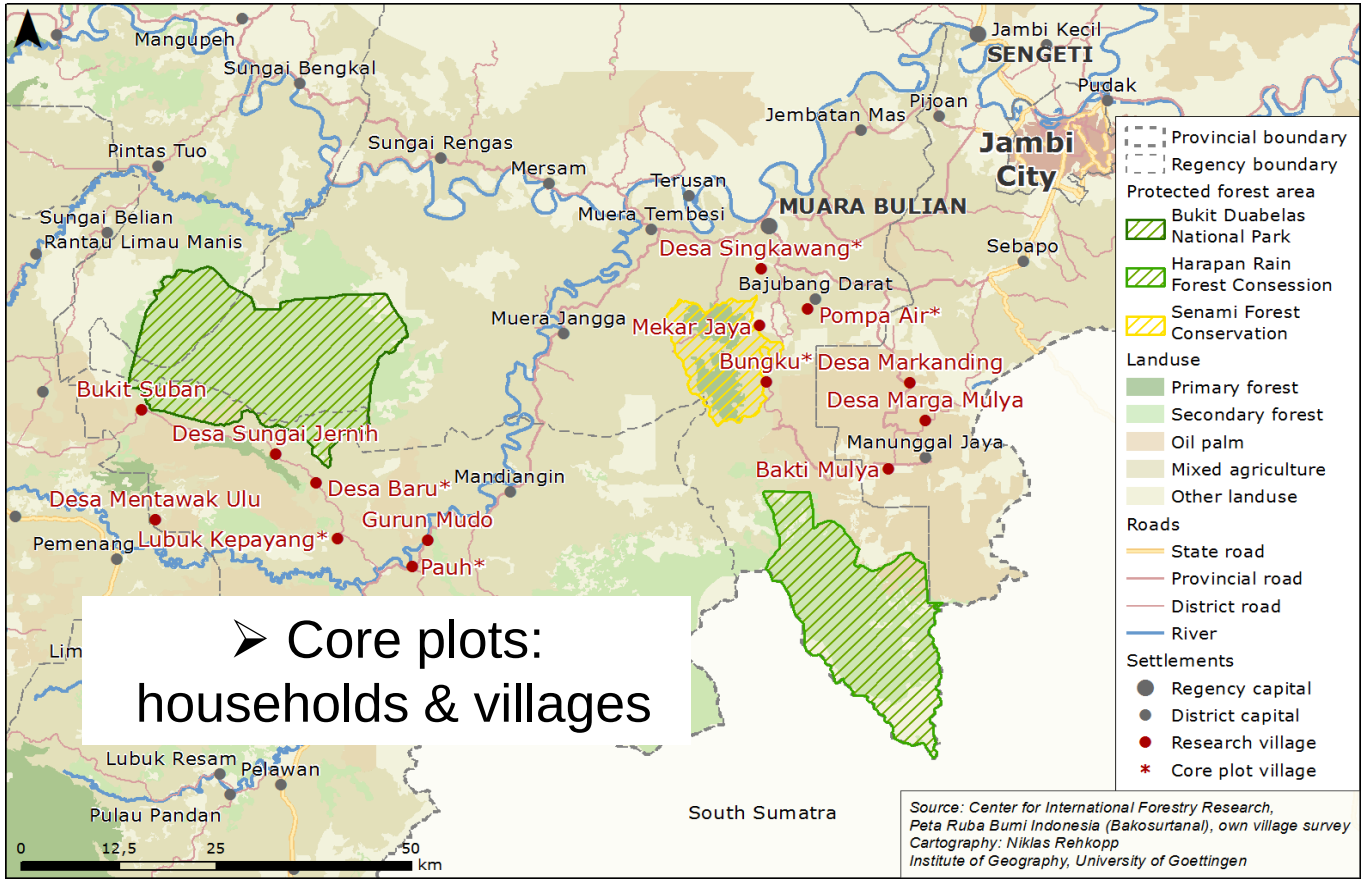
Joint sampling framework



- Integrative approach combining surveys, experiments and case studies
- International level: Stakeholder interviews

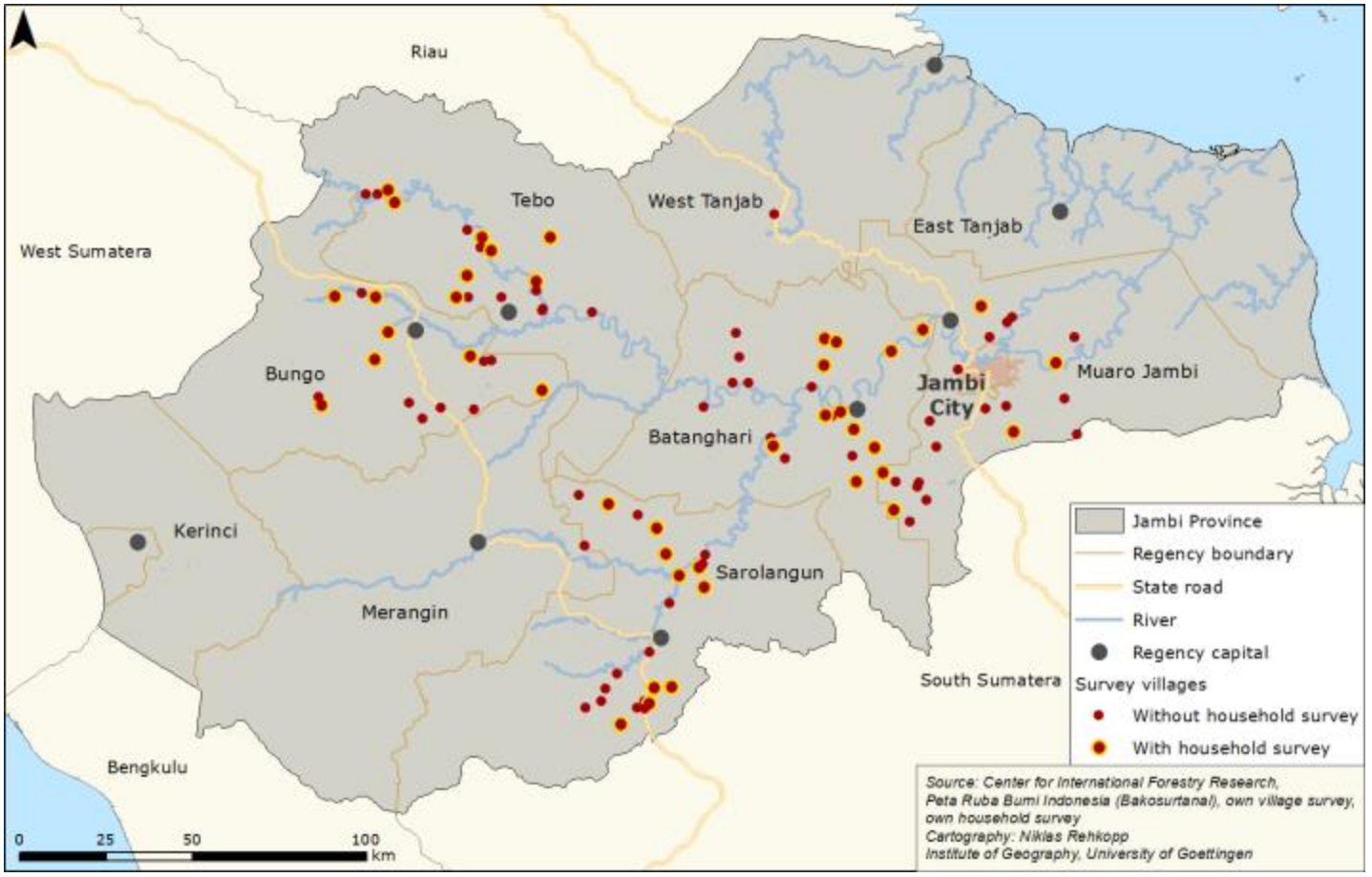
Group C: Human dimension

Hierarchical sampling design: Household ➔ region



Group C: Human dimension

Extended data collection: Household, village and trader surveys



Group C: Human dimension

First results from case studies

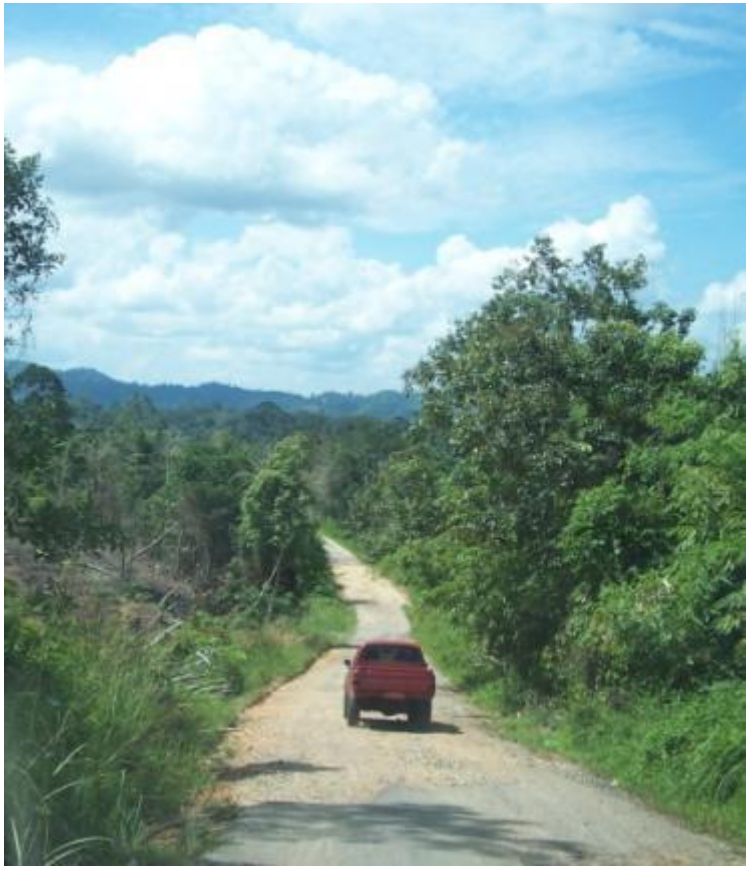
- Large scale development interventions like the initially World Bank supported transmigrant schemes are the main causes for cultural landscape transformation
- **In all transmigrant villages investigated, co-operations with private companies determined land use change from diverse land use towards monoculture**
- Basically since the reform era (1999) the former transmigrant projects are replaced by so called spontaneous migration originating from other areas of Sumatra
- **Surprisingly different forms of cultural knowledge and practices or ethnicity are not decisive factors with regard to the nature of land use**
- **The difficulty of gaining access to land bridges cultural and religious differences and leads to new alliances and strategies**, that range from strategic marriages of immigrants with indigenous people and the reselling of undocumented land plots, to occupation of concession land.
- The struggle to gain access to land and have customary land rights acknowledged by the state has given rise to local conflicts.

Group C: Human dimension

First results from surveys

- Currently, about 36% of farmer households in the study area are found cultivating oil palm and 82% cultivating rubber. Food crop production (e. g., rice) is carried out only in a marginal scale.
- Oil palm expansion is gaining momentum in the recent years. Although the rubber plots are rarely converted into oil palm, both these crops are competing for fallow and degraded forest lands for expansion.
- **Compared to the previous decades, smallholder plantations are developed less frequently through deforestation. Land acquisition through market is increasing in recent years.**
- **Contract farming in oil palm, often associated with transmigrant programs, is not widely followed at present.**
- In the past, smallholder contracts were very complex and diverse across the study area and had mixed livelihood outcomes.

CRC 990



GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

Bogor Agricultural University

Tadulako University Palu

University of Jambi

Deutsche Forschungsgemeinschaft DFG