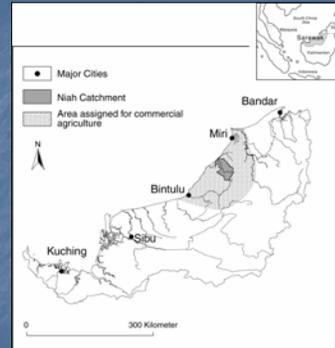


Land use and land cover dynamics in response to local-to-global socio-political forces:

Successive waves of change in Sarawak

LaSys workshop
24–26 October 2005

Tina Svan Hansen
Institute of Local Government Studies – Denmark
(Amternes og Kommunernes Forskningsinstitut – AKF)



Shifting cultivation

Traditional land use system practised by Iban and other indigenous people

Farming systems which "uses fallow as a means of maintaining productivity through weed suppression and temporal nutrient concentration, while variations in crop and fallow periods are common" (Brookfield et al., 1995)



- Piece of forest cut
- Biomass burned
- Hill rice planted
- Land left for the forest to regenerate

Farming system and Iban land use system which include production of cash crop on permanent fields



Logging

Starting at a larger commercial scale in the 1960s – peaking in the "logging era" from 1970s to 1990s

Extraction of timber from the forest

20% forest cover removed 1

1984 an estimate of 60% of the forested area in Sarawak was under logging concessions (Hong, 1987)



Large scale commercial palm oil production

First oil palm plantations established in the early 1970s

Establishment took off in late 1980s and 1990s when the forest resources became exhausted



Palm oil production in large oil palm plantations

- Vegetative ground cover is removed
- Terraced or drained
- Oil palm + 2 ground cover species
- Cultivated in 25-30 year rotations

By 2010, 1 mio. ha planned mainly located in the coastal zone

Sarawak's master land use plan

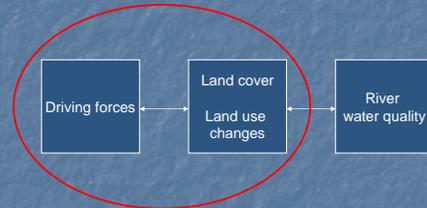
- Negative environmental effects of major land use and land cover changes
 - Haze
 - Biodiversity
 - River water quality
- In 2001, the State Government decided to develop Sarawak's first "Master Land Use Plan"
- The purpose of the land use plan is to ensure a continuous economic growth based on natural resources utilization – without destroying the natural resource base

Information needed

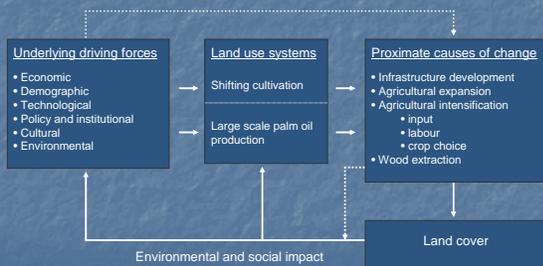
Wide range of information needed to make an efficient and environmentally sound land use plan

- Historic development
- Current land use- and land cover situation
- Interaction between the land use systems
- Linkages between land use and natural resources
- Which agents or factors influence the systems

Research issues



Conceptual framework



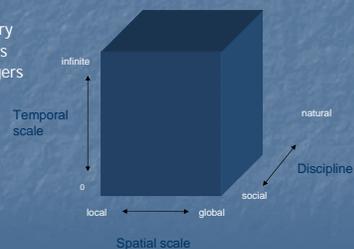
Niah Catchment



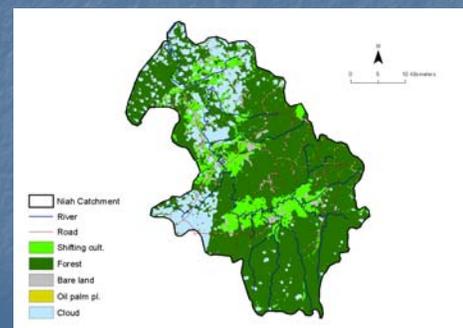
Methodology

Combining data sources (1972, 1985, 2002)

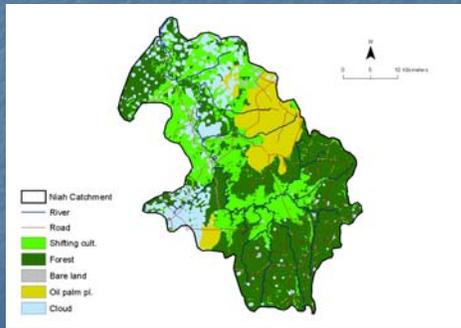
- Remote sensing imagery
- 2 questionnaire surveys
- Survey oil palm managers
- Interviews
- Secondary information



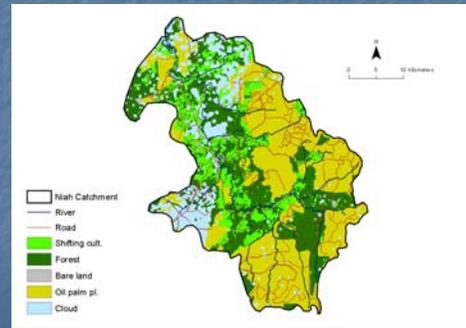
Land cover classification - 1972



Land cover classification - 1985



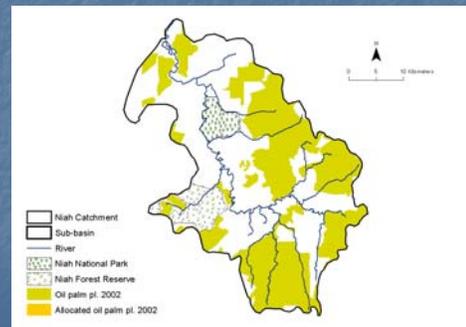
Land cover classification - 2002



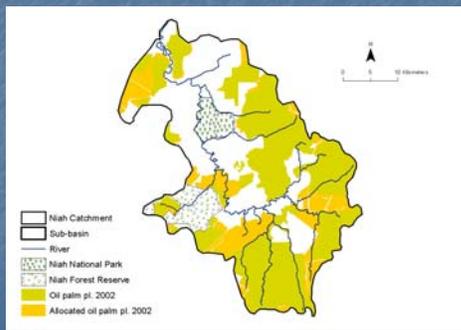
In sum

	1972	1985	2002
Forest	68%	46%	27%
Shifting cult.	13%	26%	17%
Oil palm pl.	n.a.	12%	41%

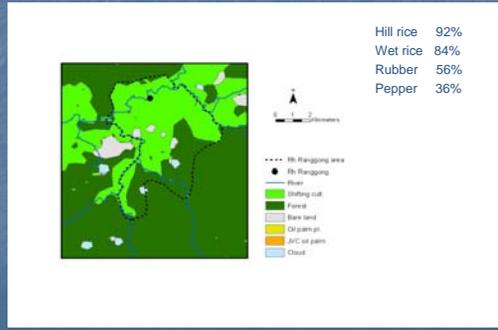
Land cover 2002 - ...



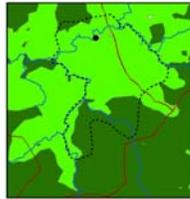
Land cover 2002 - ...



Land cover and land use - 1972



Land cover and land use - 1985



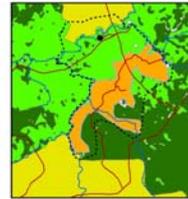
Hill rice 98%
Wet rice 76%
Rubber 66%
Pepper 68%
Vegetables

Less time spent on hill rice

More time spent on cash crops and off-farm income



Land cover and land use - 2002



Hill rice 91%
Wet rice 67%
Rubber 7%
Pepper 72%
Oil palm 56%
Vegetables – fruit

Less time spent on hill rice

More time spent on cash crops and off-farm income



Driving forces – large-scale commercial palm oil production

Policy

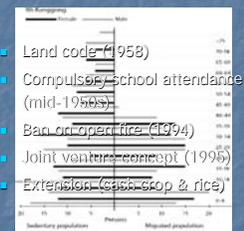
- A new ministry established to facilitate oil palm development
- Land is leased out on favourable conditions to consolidate the Chief Minister's power
- Oil palm companies get the right to clear-fell the forest

Market price

- Crude palm oil price & timber prices

Driving forces – Shifting cultivation

- Road
- Market
- Population
- Migration
- Off-farm income
- Government policy



Driving forces (spatial aspects)

	Large scale commercial agriculture	Shifting cultivation
Global/regional level	Market prices	
National/state level	Preferential policies SPA	Policy Off-farm employment
Catchment/village level		Market opportunities Off-farm employment Infrastructure "Modern culture" Demography

Driving forces (Temporal aspects)

- 1972-1985 Population (growth)
Roads (logging)
- 1985-2001 Roads (government)
Off-farm opportunities
Population (migration)
Market
- 1972-2001 Education
Cash crop promotion

Recommendations

Master land use plan

- Corridors and oil palm plantations do not conflict with State Government goal of securing a continuous economic growth based on commercial agriculture
- Securing of water catchments in future developing areas
- Modify EIA regulation by changing the prescribed activities for oil palm plantations
- Remove overlap in mandates and coordinate water monitoring

Conclusion – land cover changes

- Large land cover changes have taken place in Niah catchment over the past 30 years
- A pattern of successive waves of land cover changes
- Shifting cultivated areas expanded (1972-1985) and later withdrew (1985-2002)
- Over the past 30 years, large scale commercial driven land cover changes have played the most important role in terms of land cover changes in Niah catchment
- In the early study period, the two land use systems developed in separate areas and thus without conflict
- Now, oil palm plantations start encroaching on shifting cultivation areas with increasing tension and conflict following

Conclusion – land use changes

- Shifting cultivation still persists even in areas with many opportunities, but:
 - Ageing shifting cultivation population, with younger generation focusing on cash crop
 - Remote areas: Less intensively used
 - Easily accessed areas: Intensification, diversification of cash crops
- Increased socio-economic welfare
- Extensive migration of educated youth - > 50% migrated persons are not expected to move back

Conclusion – driving forces

- Different sets of driving forces –operating at different levels of scale
- Limited success of state government's prohibitive policy on shifting cultivation - but compulsory school attendance, extension service, improved market conditions, improved off-farm labour opportunities have caused changes in the system
- The state government single-handedly determines and plans the development of large scale commercial agriculture in Sarawak

Acknowledgements

- Farmers in Niah
- SLUSE - DANCED
- State Planning Unit- Sarawak
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- Institute of Biodiversity and Environmental Conservation
- Colleagues at IGUC and UNIMAS

