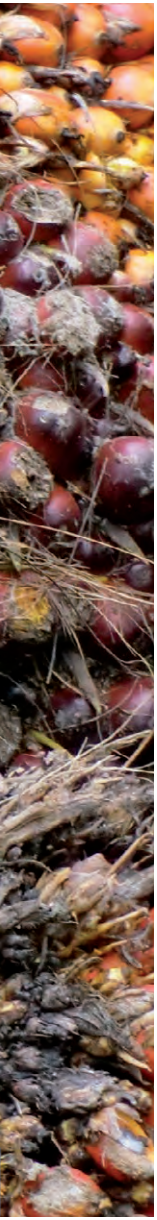
CLUSTER

Sliding from greasy land?

Oil palm fresh fruit bunches, Riau, Sumatra (by Carina van der Laan)



Sliding from Greasy Land?

Migration flows and forest transformation caused by oil palm expansion

Palm oil is increasingly used in the food processing industry as well as for the production of biofuels and other non-food purposes. Over the past decades, oil palm plantations have rapidly expanded in Indonesia, in particular on Sumatra and Kalimantan, and an estimated 6 million hectares of land is now under oil palm plantations. By 2020, Indonesia's oil palm industry is expected to have expanded by another 5 to 6 million hectares. At least 1.7 million hectares of this land is currently still forested, while close to 1 million hectares is peatland. Oil palm has been championed for bringing development to rural areas, but also criticised for being responsible for unsustainable processes of land-use change, including large-scale forest conversion and peatland degradation.

Most research into the expansion of oil palm plantations has focused on issues of land availability and the direct link between oil palm plantations and forest conversion. Very little research has been done on the indirect effects of palm oil production, most notably oil palm-induced migration. The Sliding from Greasy Land? research cluster was set up to address this gap. The integrated, multidisciplinary approach helped improve understanding of the socioeconomic and environmental dynamics at work in forest transitions in order to support local and national policy processes. The various research projects that fall under the cluster addressed: (i) the direct and indirect environmental effects of expanding oil palm plantations; (ii) the response mechanisms of local people and migrants, who try to make a living in areas where large- and small-scale oil palm plantations are expanding; and (iii) local governance arrangements, particularly related to the planning of oil palm plantations.

Sliding from Greasy Land? focused on two locations. The main focus was on Riau, where oil palm plantations have already dominated the landscape for a long time,

Institutions involved

- Faculty of Forestry, Gadjah Mada University, Yogyakarta
- Faculty of Agriculture, Riau University, Pekanbaru
- Mulawarman University, East Kalimantan
- World Agroforestry Centre, Bogor
- International Development Studies, Faculty of Geosciences, Utrecht University
- Copernicus Institute for Sustainable Development, Utrecht University
- IS Academy on Land Governance for Equitable and Sustainable Development (LANDac), Utrecht University

Research projects

1. Food or fuel: Food policies and the role of oil palm induced land conversion on food security in Sumatra? (Dr. Paul Burgers)
2. Collapsing forest ecosystems through palm oil plantations: competing claims for resources and land (PhD study by Ari Susanti, under the supervision of Dr. P. Burgers and Prof. A. Zoomers)
3. Oil palm production and migration flows (PhD study by Suseno Budidarsono, under the supervision of Dr. P. Burgers and Prof. A. Zoomers)
4. Balancing the needs for food and fuel with the provision of critical environmental services in local land use planning (PhD study by Carina van der Laan, under the supervision of Dr. P. Verweij and Prof. A. Faaij)
5. Balancing ecology and economy on peatlands (Oka Karyanto)

Location

Siak Sri Indrapura, Bengkalis, Rokan Hilir, Pesisir Selatan and Jambi

Siak Sri Indrapura, Bengkalis and Rokan Hilir

Rokan Hulu, Kampar and Pelalawan

Kutai Kartanegara and Kutai Barat

Pulau Padang and peatland areas near the coast

and where small-scale producers manage more than 60% of the oil palm area. The second research site was East Kalimantan. This province is much less densely populated and oil palm has been introduced relatively recently. Incorporating both areas in the research allowed the development paths in both areas to be compared, helping to understand the processes at work and allowing lessons to be drawn from one area that may be relevant for the other.

Master's studies under the Sliding from Greasy Land? cluster

- M. Derkzen (2011): Convert or conserve? Forest as the fuel for oil palm – an assessment of rural livelihoods and their strategies to cope in an oil palm environment in Riau, Sumatra
- S. Heijman (2011): Is the forest reduced to just an economic resource in an era of rapid oil palm expansion? An inquiry into the forest use and perspectives of the forest of local Malay communities in Riau, Sumatra
- E. Hertel (2011): Validation of ALOS PALSAR and Landsat-based land use and land cover maps: A contribution to the WWF Global Land Use and Sustainable Biomass Production Project in Indonesia
- I. Kies (2011): Aboveground woody biomass and structure of regenerating lowland forest in East-Kalimantan, Indonesia
- A. Mitsiou (2012): Oil palm expansion in Kutai Barat district East Kalimantan, Indonesia: Local drivers and implications for forest cover, local food production and local communities
- R. Visser (2011): Aboveground biomass of tropical secondary forests in East-Kalimantan Indonesia
- L. Sazzer-Krebbers (2012): Assessing stand characteristics in relation to natural and anthropogenic disturbances and environmental factors in regenerating forest in East Kalimantan, Indonesia
- G. Sonderegger, H. Lanting (2012): The challenge of sustainable peatland farming: Characterising agricultural systems in Padang Island, Sumatra regarding their sustainability
- Rafflis (ongoing): Legalitas Perizinan berdasarkan UU Kehutanan dan penataan Ruang dalam tinjauan Hukum Administrasi Negara (The legality of licenses under the forestry law and spatial planning from a public administrative perspective)

Oil palm plantation in Jambi, Sumatra (by James Maiden, CIFOR)

Smallholders love oil palm

Oil palm boosts the local economy in Riau, but at what cost?

In Riau province, large-scale companies are no longer the sole drivers of oil palm expansion. Smallholders have enthusiastically embraced the crop, and for good reasons. Research shows that villages with palm oil are better off than those without it. Attracted by this success, thousands of migrants move into Riau every year to cultivate oil palm independently of large plantation companies. While boosting the local economy, oil palm plantations are rapidly replacing remaining forest and food crop areas.

Riau is located in the centre of Sumatra. Seen from above, a large part of the province is covered with a green blanket of oil palm, interspersed with roads. Planted with mathematical precision, the crowns of the individual palm trees form a regular pattern of little stars. The remaining patches of natural forest stand out as anomalies in the monotonous landscape. For many observers it exemplifies forest destruction by large-scale commercial interests. But there is more to the story of Riau.

With about 1.9 million hectares covered with oil palm plantations, Riau is the largest producer of palm oil in Indonesia. In the 1970s the government started supporting companies wishing to establish oil palm plantations in the province. The rapid growth of plantations has often led to conflicts with local people due to unclear land governance and a lack of sound spatial planning. Despite such conflicts, the area under oil palm cultivation grew consistently, while the area covered with forest reduced at an almost equal pace. Recently, however, the main actors behind the expansion of oil palm in Riau have started to change. Whereas the growth of the area cultivated with oil palm used to be driven by large-scale commercial companies, today this is no longer the case. According to Ari Susanti, who has been studying oil palm trends in Riau, many researchers and NGOs have focused on large-scale oil palm plantations for too long. In doing so, they have turned a blind eye to the increasing roles of smallholders – both migrants and locals – who are rapidly becoming an important driving force behind the expansion of oil palm.

The second wave

In the early days of large-scale plantation development, the industry was supported by transmigration programmes to fulfil labour requirements. Some of these migrants started working as wage labourers on plantations, while others became 'supported

smallholders', cultivating oil palm as part of a large-scale scheme and using farm inputs provided by the company on credit. Since the mid 1990s, Riau has been experiencing a second wave of migrants. These are mostly farmers who move to the area to become independent smallholders, cultivating oil palm by their own means.

The independent smallholders are no longer part of a company's plantation, but arrange farm inputs themselves. Consequently they can sell the produce to any mill they choose. Their emergence was made possible by a new government regulation in 1995, which allowed mills to be established that do not manage their own oil palm plantations, and therefore need to purchase their Fresh Fruit Bunches (FFB) from independent producers. Since then the number of mills in Riau has been steadily growing, as has the number of migrants moving to the province to establish their own plantations. This trend is not likely to stop in the near future.

Currently about a quarter of the population in Riau province are migrants, and their numbers continue to grow. The province is not only attracting second-wave migrants from Java, but also large numbers from other Sumatran provinces. Some of them have been working as wage labourers on oil palm plantations and managed to save money with which they are now establishing their own small-scale plantations. There are also domestic investors buying up larger areas, sometimes up to several hundred hectares. They invite smallholders to come and cultivate oil palm, of course taking a share of the profit. And, while local communities were not initially interested in oil palm, they now see that oil palm farmers are earning good money and want to benefit from the oil palm boom as well.

Riau is the place to be for oil palm farmers, for at least two reasons. Firstly, it has many mills. In 2009 there were a total of 173 (of which 46 did not manage their own plantations) and the number has been growing since. In other words, the demand for oil palm from independent producers is high. Secondly, the road network in Riau has grown tremendously over the last decades. While in 1984 the province only had 13.6 km of roads per 1000 km^2, in 2009 this had increased to 267.6 km. This is vital for oil palm producers, who need to deliver their fruit to a mill within 48 hours of harvesting.

The expansion of oil palm threatens forest areas and food production

Oil palm as a development agent

What has been the socioeconomic effect of the rapid expansion of oil palm in Riau? Based on data from the Indonesian Central Bureau of Statistics, researcher Suseno Budidarsono has compared developments between 1993 and 2010 in villages with and without oil palm. His sample includes 516 villages, of which about 60% are dominated by oil palm. Budidarsono not only looks at changes in terms of per capita income, but also takes into account the number of schools and shops, access to electricity, roads, health institutions, banks, etc. He found that the oil palm-dominated villages stand out positively on almost all of these development indicators.

The oil palm villages are characterised by a process of wealth accumulation and investments in the non-farm sector, explains Budidarsono. In these villages, people's

purchasing power has grown rapidly, which has stimulated other types of investments. This translates, for example, into a growing number of retail, repair and video rental shops, and small supermarkets. The economic activities in the oil palm villages are thus diversifying, and the availability of purchasable food items is growing. Where the perception among NGOs is one of oil palm companies exploiting labourers and small-scale farmers, Budidarsono qualifies this view, saying "the farmers love oil palm". From an environmental perspective, he admits, the situation at the forest frontier is a cause for concern.

Pushing back the forest frontier

Oil palm plantations by smallholders are replacing the last remaining areas of natural forest in Riau, many of which formally have protected status. How then do farmers acquire access to those lands? Budidarsono stresses that local communities have recently started facilitating the expansion of oil palm in these areas. This is partly because they claim customary rights to large stretches of forested areas, and have begun to sell these lands to migrants who want to cultivate oil palm. Locals are pro-actively looking for buyers, he says. This means it is very easy to get land, as long as you have money. Budidarsono experienced this first-hand on several occasions, when the person he was interviewing asked him whether he wanted to purchase land. Seen as a potentially wealthy outsider, Budidarsono received offers for as much as 1800 hectares of uncultivated lands, to be converted into oil palm.

When Budidarsono asked about the formal status of the land that he was offered, he was told 'That's my headache, not yours'. This illustrates the situation on the ground. There is a grey area of state regulations, which local leaders seem to be using to their advantage. In the current Indonesian legal setting, local communities can claim customary rights to land, and based on this claim, village leaders feel entitled to provide individuals with an official letter that grants them the right to cultivate that land. Whether this is legal or illegal is difficult to answer. It all depends on which regulation you look at. From the perspective of the Ministry of Forestry most of these transactions are illegal, because many of these lands are classified as forest areas.

Over the past three decades the expansion of oil palm has led to significant deforestation. It is estimated that between 1982 and 2010 more than 80% of the oil palm plantations in Riau province have replaced forest areas. Today, the ongoing migration of independent smallholders, facilitated by local communities who are willingly selling their land, is exerting great pressure on Riau's remaining natural forest. Susanti's research shows that oil palm plantations have recently started expanding at the expense of peatland areas in the eastern part of Riau, which are less suitable for agriculture and thus render low profit margins, while their conversion releases enormous quantities of carbon.

Competition with food

In addition to the loss of natural forests, and the associated loss of biodiversity and increase in carbon emissions, Susanti is worried about another trend. She found that oil palm is increasingly replacing food crops, in particular rice production. In a survey among 255 randomly selected oil palm farmers in eight villages in areas near the forest frontier, she found that 46% of these farmers had planted oil palm on areas that before were primarily used to produce food. Her findings are confirmed by an analysis of province level data, which shows that around 8,000 out of 20,070 hectares of rice fields were converted into oil palm plantations between 2002 and 2009.

As a consequence, Riau has become a net importer of rice and other food items, including fruit and

vegetables. Although the income from oil palm allows people to buy food items quite easily, this development is not without risks. In mid 2008, Budidarsono recalls, the transport of rice to Riau was hindered due to floods, which caused the price of rice in the area to double. The local government responded by trying to prevent further conversion of rice fields by providing training, fertilisers and seeds to farmers who keep their rice fields. But, so far, this has not been successful.

Similar worries exist at national level. Rice is the staple food of the vast majority of Indonesians. If Indonesia were at some point to become fully dependent on other countries for its rice, so the government argues, its national food security would be in jeopardy. Not least because converting oil palm back to rice fields would be a massive undertaking. Maintaining the domestic production of rice at affordable prices is therefore seen as an issue of national security.

Ari Susanti and Suseno Budidarsono

Ari Susanti and Suseno Budidarsono are Indonesian PhD researchers with the International Development Studies (IDS) group at Utrecht University. Ari Susanti studies the processes of oil palm expansion in Riau Province, combining quantitative and qualitative methods. She is also a staff member at the Faculty of Forestry, Gadjah Mada University. Suseno Budidarsono is an Agricultural Economist at the World Agroforestry Centre in Bogor, Indonesia. His research focuses on the relationship between the expansion of oil palm, migration and rural development. For this he analyses data from 1993 to 2010 from the Indonesian Bureau of Statistics, complemented by interviews in the field.

The challenge

Riau is faced with a major dilemma: The expansion of oil palm leads to local development, but it may also cause new social problems (notably related to access to land) and it threatens forest areas and food production. Moreover, the conversion of a diverse landscape with different land-uses into a landscape consisting only of palm plantations, in combination with heavy reliance on agro-chemicals, may generate environmental problems in the longer term. For this reason there is an urgent need to better regulate the expansion of oil palm in the province. But how can this be done? Firstly, the government needs a spatial plan that clearly indicates where new oil palm plantations are allowed and where not, taking into account the long-term environmental consequences. For this, predictive computer models, such as the one being developed by researcher Carina van der Laan, can be helpful tools (see the article 'Not all degraded lands are alike' elsewhere in this publication). But a spatial plan alone is not enough. The findings of Susanti and Budidarsono highlight that the expansion of smallholders, be they migrant or local, warrants special attention. This development requires, amongst others, unambiguous regulation on customary land claims and the authority of local leaders to sell land to private investors. In addition, Budidarsono stresses, an effective way to control further expansion is to limit the establishment of new mills in the area, as they are creating the demand for oil palm in the region.

Not all experiences with smallholder involvement in palm oil production have been positive; there are many accounts of supported smallholders who have been cheated by companies, and of small-scale farmers being displaced from their lands. Moreover, those who cannot afford to invest in oil palm plantations are faced with rising prices for food and non-food items. This is of particular concern in areas like East Kalimantan where oil palm expansion has begun recently. But the research shows that story of oil palm is no longer just

about local people losing out, as the crop has become highly lucrative for a growing number of smallholders. The example of Riau shows an inconvenient truth that many find hard to accept: while constructing roads and establishing mills and oil palm plantations threatens the natural environment, it does spur economic development – at least in the short term.

Suggested reading

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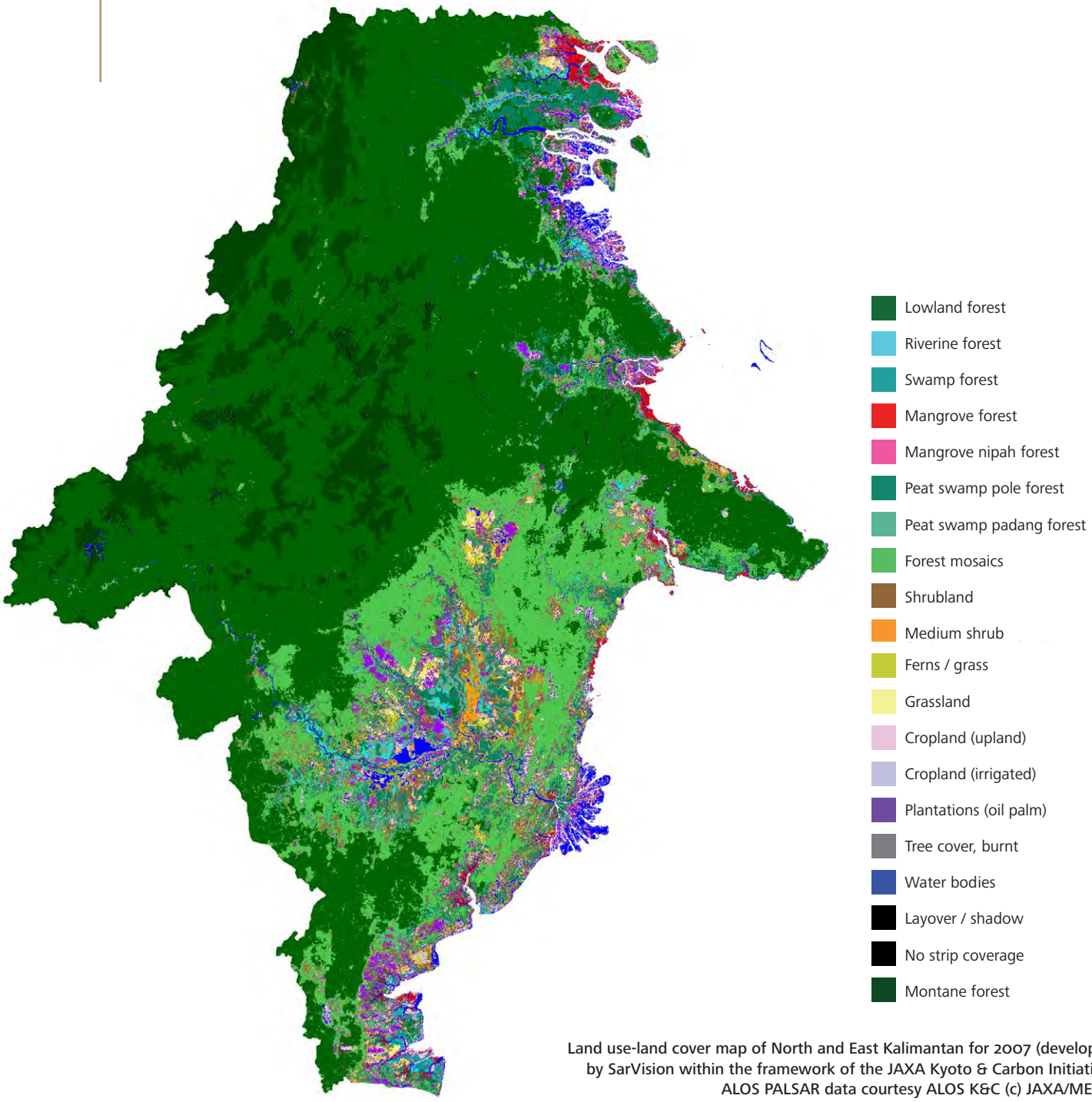

Land use-land cover map of North and East Kalimantan for 2007 (developed by SarVision within the framework of the JAXA Kyoto & Carbon Initiative. ALOS PALSAR data courtesy ALOS K&C (c) JAXA/METI).

Not all degraded lands are alike

Accounting for the regeneration capacity of disturbed landscapes in land-use planning

Decision-makers tasked with planning the location of new plantations would need to consider the long-term environmental consequences of their decisions. Land-use planning can be greatly improved by the use of computer-based decision support models. Most of these models, however, do not account for the fact that different degraded areas have different capacities to regenerate. This is what doctoral researcher Carina van der Laan is trying to improve.

The future of East Kalimantan province seems predestined. If you want to know where it is heading, just take a look in Riau province, located 1,500 kilometres away on the island of Sumatra. The areas are on a similar development path, but at different stages. Researchers from the Sliding from Greasy Land? cluster are working in both East Kalimantan and Riau, and every time they share their findings they are struck by the similar trends they detect. Indeed, East Kalimantan today looks much like Riau did a few decades ago, with large-scale fires and explosively growing plantations in a landscape that still has extensive areas of logged-over and primary forest. In Riau today, the fires and plantations have led to the loss of forests and desiccation of peatlands, and consequently to high levels of biodiversity loss and carbon emissions. Moreover, plantations for the palm oil and pulp & paper industries are competing with local food production. Is this also East Kalimantan's fate?

According to the researchers from Utrecht University, this does not have to be the case. East Kalimantan can learn from Riau and improve its land-use planning, allowing it to develop into a multifunctional landscape in which social, socioeconomic and ecological considerations are taken into account.

A focus on degraded areas

The negative effects of agricultural expansion can be limited by focusing future expansion on 'degraded lands' instead of opening up natural forests or food production areas. This may sound obvious, but it gives rise to new questions, such as: What are degraded lands? And, what are the effects of converting them to farmland?

The term 'degraded land' can be used to refer to land with all kinds of vegetation types – from logged-over forest to grassland, and everything in between. According to Carina van der Laan, researcher in the

Sliding from Greasy Land? cluster, it is important to differentiate between various types of degraded areas and to understand the social, environmental and economic effects of their conversion to agriculture. She warns against lumping them all together into one category. Policymakers may consider all degraded lands to be suitable for oil palm expansion. But this is far too simple. Some so-called degraded lands are grass and shrublands that are part of former shifting cultivation systems and which play a vital role in sustaining local people's livelihoods. Moreover, the environmental effects of converting one degraded area may be very different from converting another. Turning a logged-over forest with regeneration potential into an oil palm plantation, for example, can have severe negative effects in terms of carbon storage and biodiversity, while planting oil palm on unused grasslands may be much less problematic.

Carina van der Laan

Carina van der Laan started her PhD research with the Energy and Resources Group at the Copernicus Institute of Sustainable Development, Utrecht University, in April 2010. She is exploring the current and future impacts of oil palm and rubber expansion on carbon stocks, biodiversity and food production in East Kalimantan, Indonesian Borneo. With her research she aims to support decision-making by the private and public sector on sustainable land-use planning. Carina is collaborating with SarVision the Netherlands, WWF Indonesia and WWF Samarinda, the University of Gadjah Mada in Yogyakarta, the University of Mulawarman in Samarinda, and the World Agroforestry Centre in Bogor. Prior to her PhD research, she studied Sustainable Development in Utrecht and worked for WWF in Zeist.

The aim is to predict future effects of land-use decisions as accurately as possible

Improving projections

Both policymakers and NGOs are increasingly using spatial decision support models to show the expected effects of certain land-use choices. Over the years these models have become ever more sophisticated. But Van der Laan, who has been analysing these models in the course of her PhD, discovered that many of them are not taking account of at least one important aspect: the regeneration capacity of degraded forests. If you are trying to decide whether or not to convert a degraded forest into farmland, she explains, you need to take into account the fact that *not* converting the area will mean that the degraded forest will be able to regenerate. Many current models act as though the degraded forest will stay as it is during the model run, and this does not allow a fair comparison.

A model that does not account for an area's regenerative capacity is likely to underestimate the negative effects of converting the area to farmland. In practice degraded land is thus often allocated for plantation development without a full understanding of the potential negative consequences of this decision for carbon stocks and biodiversity. Van der Laan sees this as a serious omission. Her research aims to contribute to a better land-use planning process by improving an existing model, so it takes into account the differences between various types of degraded lands and their regeneration capacities.

To arrive at an improved model, Van der Laan first and foremost needs robust empirical data regarding land-use changes in the past, and regarding carbon stocks and biodiversity levels in different types of degraded lands. Gathering her data, she focuses on East Kalimantan, analysing time series of optical and radar satellite images and crosschecking them with data from the Indonesian National Bureau of Statistics. In addition, she works with Master's students measuring tree diameters in forests with different levels of degradation. This information is used to calculate biomass and carbon stocks using allometric equations, and the same information may also be used as a proxy for biodiversity. Van der Laan will incorporate the empirical data into a modelling exercise, helping her to make projections for the future of East Kalimantan.

Smarter land-use planning

Eventually Van der Laan and her research partners will develop a spatial decision support tool that can be customised by adding and deleting certain variables, allowing its application in other disturbed tropical forested landscapes, and doing justice to the variation between degraded landscapes and to their capacity to regenerate.

In present-day Indonesia, smarter and more responsible land-use planning is a *sine qua non*. It is required to make sure that areas like East Kalimantan can benefit from agricultural development, while avoiding the negative environmental effects that are currently being witnessed in other Indonesian provinces, like Riau. With improved models such as the one that Carina van der Laan is working on, decision-makers have a tool at hand with which they can make better-informed choices on

Accurate maps to make agricultural expansion more sustainable

There is a need to identify the lands that can be used for the expansion of oil palm plantations in a sustainable manner. This is what a group of Dutch and Indonesian researchers have been working on in the province of West Kalimantan, in collaboration with the Sliding from Greasy Land? research cluster. First, they selected several initiatives promoting sustainable oil palm, i.e., the Roundtable on Sustainable Palm Oil (RSPO), the Roundtable on Sustainable Biofuels (RSB) and the Renewable Energy Sources Directive (RES-D). Each of these has its own set of sustainability criteria. The researchers then translated these sustainability criteria into spatially explicit indicators for the province of West Kalimantan. They used spatial data to produce a map that precisely indicates which areas in West Kalimantan are in line with the various sustainability criteria, and which are not. The researchers found that a large share of the inactive concessions (i.e., areas for which a plantation permit exists but which are not yet cultivated) did not seem suitable for sustainable cultivation. Interestingly, outside the existing concessions, they have identified about half a million hectares that could be used for sustainable oil palm plantations – mostly grass- and shrublands. Many of these lands are located in areas that are erroneously labelled as forestlands on government maps. The researchers were able to create a map indicating the sustainability risks of expansion. After ground checks, for example regarding land ownership, such a map would provide a better basis for the planning of oil palm plantations compared to the old and inaccurate maps that have been used up to now. The method the researchers developed in West Kalimantan is now being tested and implemented in other parts of the world and for other crops.

where to plan agricultural expansion and where not. The aim is to predict future effects of land-use decisions as accurately as possible, to allow for land-use planning that maximises the positive and minimises the negative effects.

Suggested reading

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For peat's sake

An alternative development model for Indonesian peatlands

Peatlands are under increased pressure of plantation development as they are seen as the last 'underutilised' resource. However, large-scale drainage to make peatlands suitable for agriculture is a high risk business as its viability in the long run is still unknown. Traditional farming systems on shallow peatlands require less draining and as such seem to balance economic and environmental objectives. However, so far the potential of these systems has received little attention. Oka Karyanto, calls for an alternative, integrated approach to peatland development – based on independent science.

Peatland conversion in Indonesia

Indonesia holds an estimated 20 million hectares of peatland. Much of this land is covered with forests that supply high quality timber. Traditionally, farming was limited to the shallow peatland areas with crops adapted to the wet conditions. Nowadays, large-scale plantations of oil palm and fast growing tree species for the pulp & paper industry are being established on deep peatland areas, i.e., lands that have peat layers of more than 3 meters. These systems are not adapted to the wetland ecosystem and only thrive through intensive peatland drainage, in combination with large amounts of chemical inputs.

The conversion of peatlands has several negative effects. It changes peat forest from the most efficient global carbon sink system into a CO_2 emitting system. This is aggravated when fire is used to open up the peatlands. Fires tend to smoulder for months or even years, exacerbating the CO_2 emissions. Haze problems are also often caused by fires on drained peatlands. Last but not least, peatland drainage causes land subsidence. Some areas along the east coast of Sumatra are already experiencing the negative effects of drained (deep) peat areas. For several years, the city of *Tembilahan* in Riau province, for example, faces daily floods during high tide.

The Indonesian government recognises the risks and has several regulations in place to protect the peatlands. In 2011, the President suspended the provision of new licences on peatlands in Riau – the province with one of the largest peat areas in Indonesia. Many of the peatlands, however, were already under concession before the President's instruction, therefore large parts of the peatlands in Riau continue to be drained and converted into oil palm plantations or tree plantations for the pulp & paper industry. Recently these peatland areas have become centres of economic development, attracting large amounts of (foreign) capital and a growing number of migrants in search of a new livelihood. This has sparked a sensitive discussion about

Draining peatland for oil palm establishment in Riau (by Wakx)

developing peatlands and its viability in the long run, without jeopardising targets for economic development and environmental protection, including the CO_2 emission reduction targets set by the Indonesian government.

The absence of good maps that show the location and depth of the peat is particularly problematic for sustainable management. It results in large-scale and small-scale plantations encroaching upon the peatdomes, which are the deep peatland areas where water is naturally stored and released during dry periods, thereby keeping the peatlands moist even during dry periods. Draining these peatdomes means that the entire eco-system becomes vulnerable to drought and prone to fires. Therefore, large-scale plantations often implement so-called eco-hydro technology. This technology divides an area into specific water zones, depending on elevation. Water levels in the canals surrounding each zone are maintained through a series of comb-like relocation channels. Scientific evidence shows, however, that this technology cannot maintain the required water levels during the dry season. It is crucial to have good peatland maps to make decisions about where to develop activities. A research group from Gadjah Mada University, led by Oka Karyanto, therefore developed an advanced airborne sensing technique, called LiDAR which is now becoming available. It enables well-informed decision-making in peatlands, allowing for the separation of production zones from conservation zones.

Science-based evidence

Mr. Karyanto works in the Forestry Faculty of Gadjah Mada University in Yogyakarta and has been studying peatlands for many years. He warns that the risks of peatland conversion are real, and he has been trying to get his message across to decision makers in Indonesia. His group has initiated a series of 'high-level stakeholder consultations' which involve key representatives from the government, the private sector, NGOs, and the academic community to discuss Indonesia's future peatland management.

Locally developed agricultural systems are well adapted to the specific natural circumstances in peatland areas

During a recent high-level stakeholder consultation in Jakarta, several NGO representatives and some independent academics criticised large-scale investments in peat areas. The majority of the other stakeholders received these critical remarks with scepticism. Most domestic stakeholders do not support the scientific arguments concerning the negative consequences of peatland drainage. Several private sector representatives and politicians even believe that scientific reports stressing the risks of peatland drainage are part of efforts to weaken Indonesia's position in international trade, in response to the country's increasing share in global markets for palm oil and pulp & paper. Such notions are further strengthened by the fact that most scientific publications on these issues are not authored by Indonesian scientists. During the consultation, the supporters of peatland conversion referred to this as 'scientific colonialism'. Academics themselves proved divided and were not able to deliver a clear message on how Indonesia should manage its peatland areas.

According to Karyanto there is a need for robust scientific cost-benefit analyses that include the long-term environmental consequences such as subsidence and CO_2 emissions. Moreover, he stresses, much more evidence is needed on the feasibility of existing alternative livelihood systems in peatlands, especially those which do not necessarily need drainage and hence could provide inspiration for an alternative development pathway for peatlands. Such technologies could for example be incorporated into future business models of large concessionaires to mitigate the negative impacts of intensive draining, or help newcomers to build a sustainable livelihood.

Alternative development pathways

In large parts of Sumatra and Kalimantan, smallholders have developed agricultural systems on peatlands that require little or no drainage. They cultivate economically valuable perennial crops including sago, rubber, coconut and fruit trees, while some also produce rice. In South Kalimantan, for instance, communities cultivate rice in a tidal peatland system. Farmers know exactly which species do not mind having 'wet feet' and thrive well under peatland conditions. Such locally developed agricultural systems are often overlooked, even though they are well adapted to the specific natural circumstances in peatland areas.

Gabi Sonderegger and Hester Lanting of Utrecht University, under the supervision of Paul Burgers and Oka Karyanto, studied small-scale farming practices in peat areas on Pulau Padang in Riau province. They found that most farmers cultivate a combination of rubber and sago without extensive peatland drainage. Sago is often used as a substitute for rice, but the flour can also be used for various modern food items and in the chemical industries. This area is known to be among the best sago producing areas in Indonesia.

Sonderegger and Lanting discovered that several farmers on Pulau Padang experimented with planting oil palm in the early 2000s (after the government started subsidy programs providing free inputs), but according to the farmers, the oil palms do not grow well on deep peat soils and require large amounts of fertilisers and herbicides, driving up the costs. With relatively low yields, farmers did not judge this to be a viable option for peatland areas. A recent survey showed that despite similar inputs (fertilisers and maintenance), oil palm grown on deep peatland only reaches 20% of the profits of oil palm planted on shallow (fertile) peatland.

Locally developed small-scale systems tend to require much less drainage compared to large-scale oil palm plantations, thereby reducing greenhouse gas emissions and the risk of subsidence. Moreover, these small-scale systems allow for a combination of cash- and food crops, and can thus play an important role in providing local food security. Research from Karyanto's colleagues in the Sliding from Greasy Land? cluster shows that local food production is of increasing importance in a province like Riau, which is now importing rice. Sago grown on undrained peatland could be one promising alternative route of peatland development and local governments have started to become more interested in ways to improve local food production along these lines.

Oka Karyanto

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The way forward

Karyanto and his colleagues stress the need for a science-based discussion on ways to integrate the needs of local people in peatland areas, while securing large-scale investments and minimising environmental risks due to peatland drainage. They found, however, that there is little trust in international science among the stakeholders. That trust needs to be restored. This does not only require more involvement of Indonesian scientists in the debate, but also calls for increased efforts to communicate the research outcomes to other sectors of society, and to engage in an open discussion to try and integrate the multiple perceptions and interests in peatland management. The stakeholder consultations organised by Karyanto's group are an important first step in that direction, setting a basis for mutual understanding. In-depth research is needed on the feasibility of specific large-scale developments, including future projections of risks associated with large-scale peatland draining. Such projections must be accessible to all relevant stakeholders. With small-scale migrant farmer families entering the peatland areas, of special importance are opportunities for systems that combine cash crops with food production. Integrated farming systems with little or no drainage, which have existed for generations, may provide the starting point for an alternative development pathway.

Suggested reading

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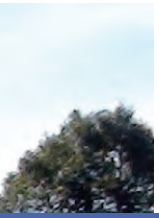
Young oil palms planted on former rice fields, West Sumatra (by Paul Burgers)

A BLESSING AND A CURSE

Conclusions from the cluster Sliding from Greasy Land?



The demand for palm oil is ever increasing. It is considered a healthy fat for the food processing industry, and is used to produce low-carbon fuels and many other non-food items. The growing demand has triggered unprecedented levels of oil palm expansion, especially in Indonesia. It has become Indonesia's favourite crop, generating large amounts of foreign exchange as well as economic development in rural areas.

One of the main overall conclusions of the Sliding from Greasy Land? cluster is that small-scale producers are increasingly becoming a driving force for further oil palm expansion. In Riau province, the first palm oil producing province in Indonesia, over 50% of the land under oil palm is now managed by small-scale producers. High earnings from palm oil production, employment prospects, rapid urban development and good road access are attracting ever more migrants from other parts of Sumatra and from other Indonesian islands. They often start working as labourers on existing oil palm plantations or find work in the non-farm sector and then use the money they have earned to purchase land to cultivate oil palm independently. They can easily buy land from local communities. Unclear boundaries between land within and outside the state forest zone, combined with weak law enforcement, allow local communities (or more accurately: powerful individuals within these communities) to claim land as part of their village territory and then treat it as a marketable commodity. In many cases village heads may even provide some sort of land certificate. Selling land has become a lucrative business, as many migrants are looking for areas to cultivate, while entrepreneurs with an interest in land speculation further increase the demand. Although it generates immediate cash income, the money tends to accrue to a limited number of people, and there are concerns about the long-term social and environmental consequences of these developments.

The growing demand for land to cultivate oil palm is moving the forest frontier into remaining and weakly protected state forest areas in the eastern parts of Riau province – including national parks and peatland areas – leading to biodiversity loss and carbon emissions. In addition to problems associated with conversion of natural areas, researchers found that farmers are increasingly converting their own rice fields into oil palm plantations. One reason for moving away from rice production is the increasingly unpredictable rainy

season. Oil palm has become a good alternative, as it is less prone to changing climatic conditions. With high palm oil yields and the opportunity to buy mainly imported rice, it is a rational choice for many farmers to move away from rice production. Between 2002 and 2009 around 40% of all converted rice fields in Riau had been turned into oil palm plantations. The conversion of rice fields in combination with the province's rapid population growth (5%) due to in-migration has made Riau into a net importer of rice. The government – through a state-owned enterprise called BULOG that imports rice into the province – tries to keep rice supplies and prices stable, but this is considered a short-term solution. Although the income earned with oil palm cultivation enables local people to buy their food in shops, the decrease in rice production has become a national concern. The Indonesian government has therefore made it a policy objective to become self-sufficient in rice production. This is considered important for national stability, since rice accounts for a relatively large share of household expenditures in most parts of the country.

The results of the Sliding from Greasy Land? cluster underline the urgent need to close the loopholes in the law, which allow semi-formal land deals between local people, migrants and speculators, and to manage population growth (migration in particular) and land use in oil palm areas. Although there is a strong national food policy, in the Indonesian decentralised context the implementation of this policy is largely in the hands of provincial and district governments with limited capacity and resources. Furthermore, the research outcomes stress the importance of land-use planning, with a focus on guided agricultural expansion into areas that are already severely degraded. This is particularly important in more recent production areas like East Kalimantan province, which is now witnessing land conversion processes similar to those in Riau a few decades ago, characterised by the rapid development of large-scale plantations and conversion of forest areas. Guiding oil palm expansion towards degraded areas instead of opening up land within natural forests or converting food production areas, is expected to result in positive effects in terms of carbon storage, biodiversity and local food security.

Better planning requires sufficient capacity at local government level. For this reason researchers have been working on a decision-support model, designed to help local governments to oversee the consequences of their planning decisions. Such modern tools, based on satellite images and computer models, can be used to make sure that planning takes account of current vegetation, levels of degradation, regeneration capacities and land-uses. The aim is to enable local governments to find optimal trade-offs between development objectives, local food security and environmental conservation. This is especially urgent for provinces like Riau with extensive peatland areas and East Kalimantan where the oil palm boom is now rapidly changing the landscape.