Summary Report

Forest Landscape Restoration in Central Kalimantan

A new opportunity for farmers,
the industry and the construction sector

UNIQUE forestry and land use

BIt Borneo Institute

fairventures worldwide

Summary report of the Project **"Rehabilitation of degraded lands with native tree species in Kalimantan, Indonesia"**

Report available online under
www.fairventures.org/flrstudy

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1. Introduction

Forest Landscape Restoration and Timber ValueChain Development as an Economic Driver for Indonesia

Since 2011, the Bonn Challenge translated UNFCCC and CBD targets into a global, implementation-driven movement for Forest landscape Restoration (FLR). The main objective of the Bonn Challenge was to promote a private-sector driven implementation of FLR on the ground. Displaying an equal consideration for climate, biodiversity and livelihood benefits, the aspiration grew to placing 150 Million hectares of degraded landscapes under restoration by 2020 and 350 Million hectares by 2030. This would ensure significant contributions to different multilateral environmental agreements and the Sustainable Development Goals (SDGs).

Restoration of degraded forest landscapes in countries such as Indonesia is crucial. In many parts of the country, large areas and land use-dependent local communities need massive investments to develop and implement appropriate restoration models. Climate change impacts local populations strongly. The current status threatens their livelihoods and resilience, due to the loss of vital ecosystems. Therefore, these people need long-term technical support and investments to cover upfront costs, address barriers and build sustainable value chains.

In line with the global objectives and the spirit of the Bonn Challenge, Fairventures, the Borneo Institute and UNIQUE have worked on demonstrating the feasibility of technically sound and financially viable restoration models in Central Kalimantan between 2016 and 2020. The generous support of the German International Climate Initiative (IKI) made this possible. As in other parts of the world, the needs and potentials are well recognized. However, it takes time and adjustment to develop viable and scalable business models through on-the-ground implementation. Moreover, many unexpected challenges accompany this process.

The Fairventures approach for Central Kalimantan aligns with the Social Forestry Initiative of Indonesia and aims at supporting its successful implementation - with and for local communities and farmers. It enables them to sustainably manage their land through appropriate forestry and agroforestry models. FVW, the Borneo Institute and UNIQUE are convinced that any successful land restoration necessarily requires the landowners' understanding of the socio-ecological benefits - including

higher and stable incomes and improved livelihoods. To this end, the program had two main areas of focus: (1) restoring degraded lands through agroforestry, and (2) improving relevant value chains - i.e. lightwood tree species (Sengon and Jabon), and crops such as peanuts, cocoa, or turmeric, which can be produced in agroforestry systems.

This report summarizes the findings of the technical feasibility studies, the practical experiences and the challenges to successfully upscale the various FLR models in Central Kalimantan. The authors hope that the momentum created through the Bonn Challenge and the beginning of the UN Decade on Ecological Restoration will attract the support needed to tap the massive potential benefits of effective restoration in this part of Indonesia.

The most important finding of the project is that FLR provides a huge opportunity for Indonesia to restore the economic and ecological functions of its forests, to provide sources of income to local communities, to build a modern timber processing industry, mitigate climate change and become a regional leader in the green economy. In order to realize this opportunity, actors from government, private sector and civil society should work together to build inclusive and transparent value chains and create conditions where this approach can be scaled throughout Indonesia.

We are proud to put forward this report, which details our efforts to explore and expand FLR approaches in Central Kalimantan. We are grateful to everyone who has worked with us over the last years, especially our partners in the Indonesian government, the Indonesian Lightwood Association, our donors and, last but not least, the local communities who made this project possible. We hope that everyone involved will recognize the enormous potential of FLR approaches, particularly in Central Kalimantan, to pave the way towards a prosperous future.

Best regards,

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2. Background

Forest Landscape Restoration in Indonesia and Central Kalimantan

According to IUCN, Forest Landscape Restoration (FLR) is the ongoing process of regaining ecological functionality and enhancing human well-being across deforested or degraded forest landscapes. FLR is more than just planting trees – it is restoring a whole landscape to meet present and future needs and to offer multiple benefits and land uses over time. Indonesia is the country with the third-largest rainforests on earth, and large areas are deforested or degraded.

In Central Kalimantan, deforestation and degradation is a result of activities in the mining, forestry and palm oil sectors. On the ground, the result of economic activities is a mosaic of remaining primary forests, biodiversity-rich secondary forests and open, degraded areas, alongside areas designated for the cultivation of oil palms and other crops. Forest Landscape Restoration works in this context, offering solutions for an integrated management of the landscape, that provides economic, social and ecological benefits at the same time.

The following example, an aerial picture from the Fairventures project area, illustrates the situation: In the Southern part, oil palm plantations have been established. The middle section of the map consists of a mixture of secondary forests, open degraded areas and reforested smallholder plots initiated by the project. In the North, larger areas of primary forest remain. Reforestation in this context is one tool to improve the functionality and benefits in the whole landscape and compliments protection of forests, but also cultivation and other economic activities.

Indonesian Government Priorities

The Indonesian government has significantly transformed its outlook and policies for forestry and the entire land use sector. Prominent recent examples include in particular the Social Forestry Initiative (Hutan Kemasyarakatan), the village law (Dana Desa), and Indonesia's Nationally Determined Contributions (NDC) to the Paris Agreement. They underline Indonesia' intentions to leverage sustainable land use, and with this to effectively reduce poverty, mitigate greenhouse gas emissions, strengthen resilience to climate change, and to build a green economy in the country. Fairventures, Unique and Borneo Institute have studied these programs and the political priorities and have designed their activities to work within these political priorities.

1. Social Forestry

The Indonesian government's social forestry scheme aims to transform large forest areas into legally recognized forms of community tenure. Through granting tenure over forest areas to communities and community groups the scheme seeks to provide economic opportunities for communities in areas adjacent to forest and improve tenurial rights.

The social forestry program was launched in 2007. The program's momentum has significantly increased under the administration of President Jokowi. His administration established the 'National Medium-Term Development Plan' (2015 - 2019). It aims to grant Social Forestry licenses over 12.7 Mio ha all over Indonesia, and 1.5 Million hectares in Central Kalimantan alone. So far the administration has issued 2,299,100 ha of licences to social forestry areas. The Ministry of Forestry will continue their path towards the 12.7 Mio ha target. Social Forestry areas in Central Kalimantan often consists of the mixture of land described above, with degraded areas and remaining forests and is therefore a good legal framework for the implementation of Forest Landscape Restoration.

2. Poverty Reduction

The Indonesian government has issued a large variety of poverty reduction programs. The two programs most directly affecting our FLR approach are:

a. Dana Desa - 'The Village Law' (Based on Law 6/2014)

This village fund program requires the central government to allocate funding to individual provinces and districts in addition to other intergovernmental transfers. Each village is given autonomy to determine the use of this funding, which is then formally proposed in an expenditure plan. This scheme is part of Jokowi's vision to develop Indonesia "from the periphery". The president of The International Fund for Agricultural Development (IFAD), Gilbert Houngbo, believes the program to be a catalyst for rural transformation via the agricultural sector. Between 2015 and 2018, the funding scheme developed 191,600 kilometres of village roads, 58,000 irrigation units, 8,900 village markets, and up to 24,000 clinics for pregnant women and children.

The amount of allocated funding has also increased over the four year period, reaching Rp 60 trillion in 2018. According to the Minister of Villages, Disadvantaged Regions and Transmigration, Eko Putro Sandjojo, the distribution of funding has been a smooth and transparent process. He cites community involvement through monitoring and supervision as key success factors.

b. Tanah Obyek Reforma Agraria (TORA)

This agrarian reform, in conjunction with social forestry programs, intends to ensure the availability of land for members of local communities and Indonesian traditional law communities, to create sources of prosperity for communities in rural areas, in particular employment opportunities as a means to effectively reduce poverty. The allocated land for TORA is 9 Mio ha. Here, the status will be changed from Forest Area to Areas for other Purposes (APL). This includes 4.5 Mio ha, for most of which the status of full legal ownership needs to be finalized. The areas converted to APL, are more vulnerable to other types of conversion as it is easier to obtain licenses in them for non-forest purposes.

The remaining half includes public land and 4.1 Mio ha of Legal Forest Area. This area has been identified and mapped under the auspices of the Ministry of Environment and Forestry Decree (MOEF), which sanctions an Indicative Map of Forest Areas for TORA. Of 4.1 Mio ha of Forest Area that will be allocated for purposes of land reform, 2.17 Mio ha are Convertible Production Forest which is no longer productive.

Both of the above programs interact with social forestry. Dana Desa may be able to be used to develop cooperative businesses on social forestry land. TORA will likely contribute to deforestation and the importance of social forestry as a form of environmentally friendly title for communities.

3. Climate Change

Indonesia's revised NDC of 2020 entails a unilateral reduction target of 29% below business-as-usual (BAU) GHG-emissions - including land use, land use change, and forestry (LULUCF) - by 2030. Additionally, the government has a conditional target of up to 41% reductions below BAU with sufficient international support. As stated in Indonesia's NDC, REDD+ remains an important component of the country's emission reduction target for the land-use sector.

Indonesia will attempt to meet the targets via various mechanisms. Concerning land use policies, Indonesia prioritises work on protecting and restoring its natural forests. This includes peat management, effective land use and spatial planning, sustainable forest management, and the restoration of degraded ecosystem functions to improve their productivity. Forest Landscape Restoration is well-suited framework for these activities and delivers economic benefits alongside climate change mitigation.

Conclusions

The Indonesian government's priorities for forestry and land management are interlocking. They seek to achieve rapid poverty reduction and agrarian economic development. Simultaneously, sustainable land management will improve to protect the environment and reduce GHG-emissions. The findings of these projects demonstrate the potential of large-scale reforestation and value chain development to accomplish even such ambitious objectives.
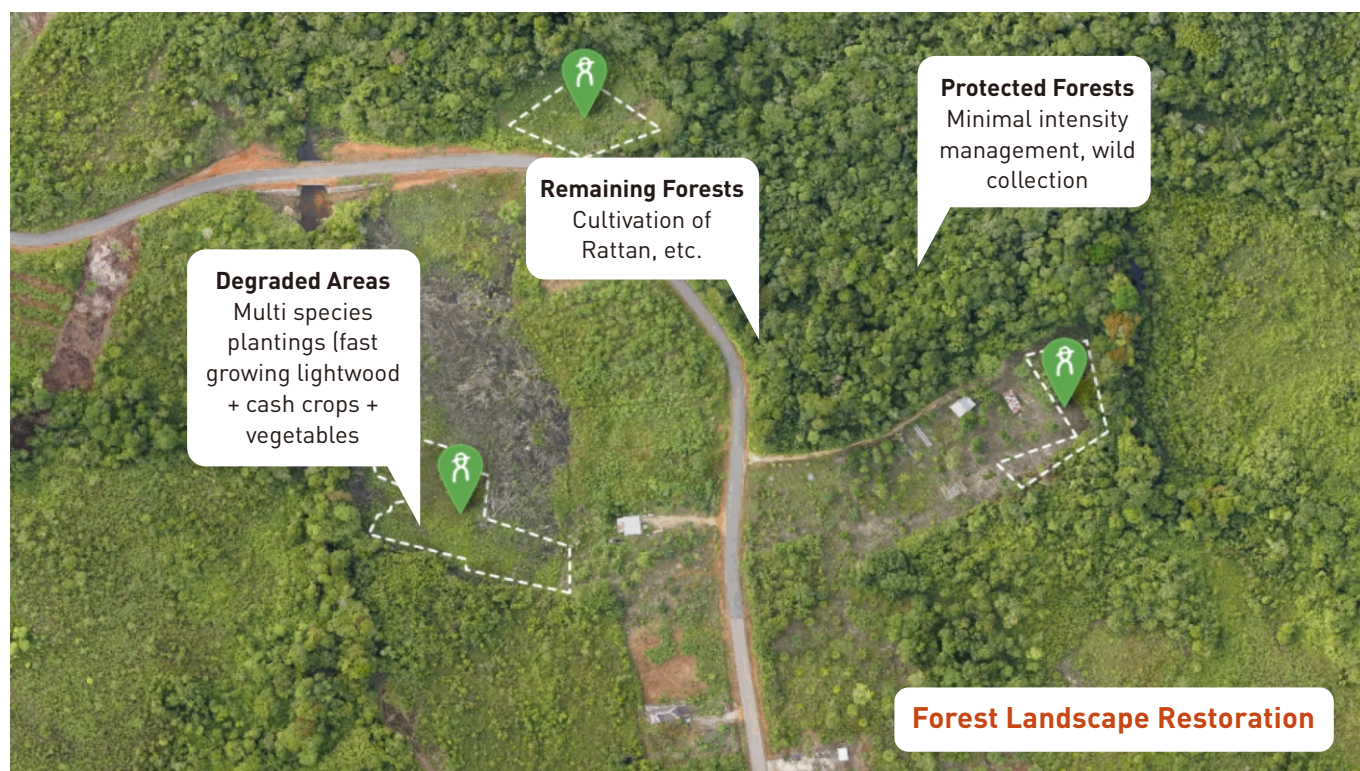
3. The Fairventures Model

Fairventures has proposed and tested a restoration model anchored around planting and cultivating fast-growing timber species. These species offer many advantages. The time between planting and harvest lies between 7 and 10 years. They can be planted on degraded soils and improve them over time. And, most importantly, there is strong demand for the timber from the wood-processing industry.

The model works well for individual smallholders and on larger areas, for example on concessions or Social Forestry areas (Hutan Kemasyarakatan). Fairventures supports both models.

Smallholder Lightwood Planting

Background and Challenges

Smallholders in Kalimantan have traditionally cultivated rice and other crops in swidden fallow systems. They used controlled burning to clear land, plant rice and other crops. Usually, they abandoned the field after 2-3 harvest cycles to let the soil regenerate because it was no longer fertile enough to support cultivation. Alongside, smallholders have planted rubber trees (Hevea Brasiliensis) and sold the latex to the rubber-processing industry. This system generated sustenance and limited incomes for the farmers. Hunting, fishing and wild collection in the natural forests complimented their incomes.

Protected Forests
Minimal intensity management, wild collection

Remaining Forests
Cultivation of Rattan, etc.

Degraded Areas
Multi species plantings (fast growing lightwood + cash crops + vegetables

Forest Landscape Restoration

Swidden fallow cultivation is an extensive system, which was traditionally not challenging, since land was readily available due to low population density in Borneo. In addition, the soils in Borneo, which are much poorer compared to the volcanic islands Java, Sumatra and Bali, were not suited for permanent cultivation. Thus, the farmers on Borneo lack the knowledge that, for example, Javanese farmers have accumulated over centuries. Such knowledge includes intensive cultivation, mixed cropping in agroforestry systems and soil improvement with compost, terassing and crop rotation.

Today, Kalimantan farmers face many intertwined challenges: population growth and other uses, such as concessions, have limited the land availability. Regulations prohibiting the use of controlled burning have made traditional cultivation methods unusable. Steadily decline of natural rubber prices has diminished the attractivity of the traditionally strongest cash crop in the region. In summary, traditional Bornean types of land use do not yield the incomes necessary to sustain a family and prosper in a modern society. The approach integrates with the fragmented state of forests in Kalimantan.

Benefits

The cultivation of fast-growing tree species in agroforestry systems offers a unique opportunity to address these challenges and provide farmers with an opportunity to earn sustainable incomes while contributing to the restoration of the land in Borneo.

Some key elements of a smallholder cultivation system are:

- species such as Sengon and Jabon are able to grow on degraded soils and even improve the soil quality over time due to their nitrogen-fixing abilities
- The timber of fast-growing trees provides an attractive source of income after an average rotation time of 7-10 years, depending on sites and treatment,
- ntercropping fruits and vegetables adds short-term income generation and supports the food security of the farmers
- The proof of legality for lightwood species is simpler than hardwoods - they do not grow in large numbers in natural forests

Prerequisites for Scaling

The example of Central Java shows that Sengon stands of less than one ha can improve a family's income significantly. Although the distance to the market is longer in Kalimantan (and thus the price per cubic meter of timber at the roadside lower), Farmers in Kalimantan have on average more land than farmers in Java.

In order to make smallholder Sengon cultivation in Central Kalimantan viable, the farmers need access to high quality seedlings, knowledge and support for growing the trees and a reliable market access, all of which could be provided through a network of larger commercial operations, for example through the Social Forestry initiative, that include the smallholders as outgrowers.

Fairventures Investment Model Based on Lightwood

Background

On the other hand, using larger land areas in a partnership model with professional management of the planting process, cultivation of trees and cash crops and integrated conservation of remaining forests on the same area is a sustainable, profitable and scalable business case that brings benefits to smallholders, mitigates climate change, contributes to the conservation of biodiversity and delivers returns to investors and tax revenue to the Indonesian government. Fairventures Social Forestry in partnership with the HKm Batu Bulan is building a sustainable and scalable FLR business model. This pioneering approach is intended as a showcase to be replicated by other companies in Central Kalimantan and other parts of Indonesia. FSF's pilot case identifies challenges and builds appropriate mitigation strategies for others to adopt. Incorporating these insights ensures an increasingly more robust model, which will be attractive to investors due to its degree of testing and confirmation. The model would benefit significantly from upscaling, in regard to value chain development, reduction of costs and economic and ecological impact. Public funding plays a role to bridge the gap until commercial private funding is available, and support the development of an enabling environment.

Benefits

The FSF showcase delivers benefits in three dimensions: In the economic dimension, the project records an IRR of 10% for investors in a base case scenario. In the social dimension, the showcase provides income through steady employment for 120 persons, the great majority of which are members of the partner communities. In addition, they receive a share of the revenue. In the ecological dimension, the showcase will reforest 1,200 hectares of degraded land and conserve additional 1,800 hectares of forest and sequester more than 200,000 tonnes of carbon (excluding the reduction of emissions from reduced deforestation).

Challenges

Naturally, challenges accompany such an ambitious model. Some of the key challenges revolve around (1) legal clarity, (2) infrastructure, and (3) institutional support. First, FLR development projects and investors need clear land title structures and clear legal regulations regarding e.g. international cooperation in Social Forestry, access to suitable areas, and a clear distribution of rights to carbon credits for projects. Secondly, FLR projects require comprehensive infrastructure development to reduce transportation costs and guarantee success of scaling. Lastly, public investment and institutional support from government agencies, supporting communities and local business partners with management capabilities, socialization of SF, financial support and legal advice is necessary to guarantee successful partnerships with international investors.

Requirements for Scaling

Overall, new legal structures for financing partnerships are necessary. FLR - under the umbrella of Social Forestry - remains fairly new, thus, bearing high risk. Innovative finance structures from government and third parties are necessary to overcome initial challenges and make FLR successful. Scaling FLR with Indonesia's Social Forestry concept bears high potential since many permits have already been issued and are waiting for implementation. Government agencies have an opportunity to analyse the first pilot cases and improve internal coordination and cooperation with SF communities and investors based on this

experience. In addition, areas holding secure land titles, e.g. concessions and FMUs, provide an additional potential for growth. Through these two potential growth opportunities, FSF will be able to scale the FLR model to more than 100.000 ha until 2030 and to contribute to the success of Indonesia's Social Forestry Initiative, climate change targets and poverty reduction strategies.

Interactions between smallholder reforestation and investment into larger areas
If both models are implemented in the same area, both sides can access the same infrastructure and the smallholders benefit from the knowledge and sales channels of the company, providing them with quality inputs and better prices. The company, in turn, can use downtimes in their own operations to increase the amount of timber they can move through their system. This combination is a good example for an outgrower scheme that benefits both sides.

The following chapter will outline some of the technical aspects of FLR concerning both models and how the project has addressed them.
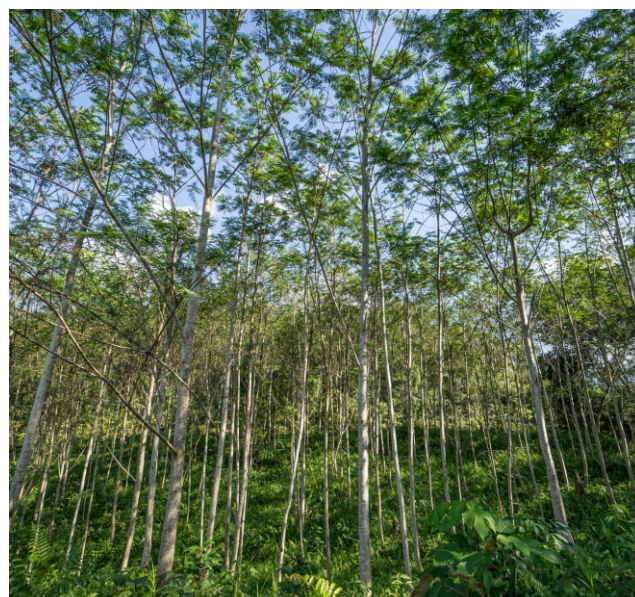
4. Technical Feasibility of FLR in Kalimantan

Fairventures, UNIQUE and the Borneo Institute have selected tree species with good growth potentials, suitability for the soils and environmental conditions in Borneo and strong market demand.

The three most prominent tree species planted in the context of Fairventures projects in Indonesia are Sengon (Paraserianthes falcataria), Acacia (Acacia mangium), and White Jabon (Anthocephalus cadamba).

Sengon
Paraserianthes falcataria

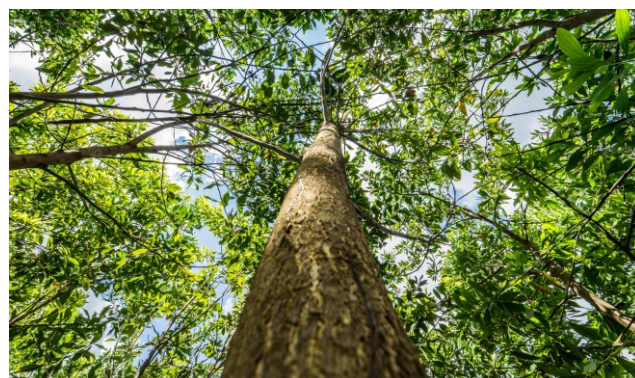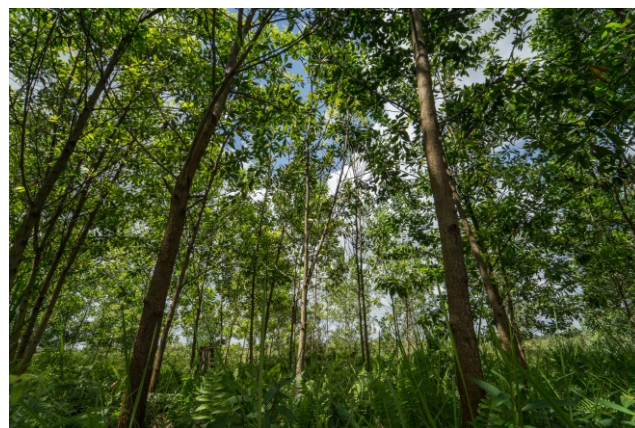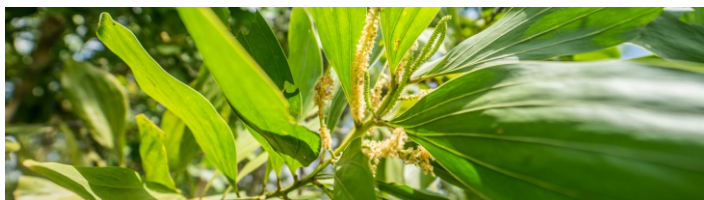| Common Name	Sengon
Latin Name	Paraserianthes falcataria
Origin	Maluku Islands, New Guinea
Ecology	Pioneer species in secondary lowland rainforest and in light montane forest, grassy plains. Light demanding, nitrogen fixing tree species that can grow on poor sites and with only moderate water supply. Sensitive to fire, shade, strong winds, water logged soils, longer periods of drought.
Specifications	max. height = 40m max. diameter = 100cm wood density = 280 kg/m3
Wood Characteristics	Light tan, soft with long fibres.
Uses	Plywood, Blockboards, Barecore, shade or shelter tree for intercropping or livestock, soil protection & improvement.

Acacia
Acacia mangium

Common Name	Acacia
Latin Name	Acacia mangium
Origin	Australia, Indonesia, Papua New Guinea
Ecology	A. mangium is a species of the humid, tropical lowland zones. Grows behind mangroves in seasonal swamps, along streams and on well-drained flats, low ridges and mountain foothills. Light demanding, nitrogen fixing tree species that can grow on dry or partially waterlogged poor sites. Sensitive to shade.
Specifications	max. height = 25-35 max. diameter = 40cm wood density = 515 kg/m3
Wood Characteristics	medium-brown, hard, strong and durable.
Uses	Paper, Woodchips, Timber for outdoor furniture, soil protection & improvement, wind or fire break, charcoal production, tannin extraction

White Jabon
Anthocephalus cadamba

Common Name	White Jabon
Latin Name	Anthocephalus cadamba
Origin	Australia, China & South East Asia
Ecology	Grows best on moist sites, often in secondary forests along riverbanks and in the transitional zone between swampy, permanently flooded and periodically flooded areas. Sensitive to weed competition, frost, drought, water logging.
Specifications	max. height = 45m max. diameter = 160cm wood density = 425 kg/m3
Wood Characteristics	White with a light yellow tinge becoming creamy yellow on exposure, good processing properties, not durable.
Uses	Engineered timber for Construction, Plywood and Blockboards, the dried bark is used as medicine for fever.

A second consideration was the selection of sites for the pilot and identification of additional areas for scaling the planting model. It is important to select appropriate areas for planting Sengon and other fast-growing species in Kalimantan. These criteria can be condensed to (1) legal, (2) technical, and (3) economic aspects.

1. Land Governance Regime

For an outsider, Indonesia's land governance regime can appear complicated, with many classifications that permit different activities, from conservation to agriculture to forestry activities. Additionally, there are social forestry classifications that allow local communities to conduct replanting activities. The project team selected land tenure classifications that allow replanting and management of forestry. Conservation areas and all areas with forest cover greater than 10 percent were excluded.

2. Technical Conditions

Kalimantan has rugged terrain and diverse soil types that limit the area where Sengon and other species can grow well and quickly. Planting sites should not have too high a slope, as this makes it difficult for mechanized planting, management, and harvesting - necessary conditions for successful forest management. The soil type is also important as Sengon and other commercial lightwood species do not grow well in sandy soils. Field testing of different species confirmed that Acacia mangium can grow much better on Sandy Soils, thereby rehabilitating degraded sites and paving the way for introducing other suitable species at a later stage.
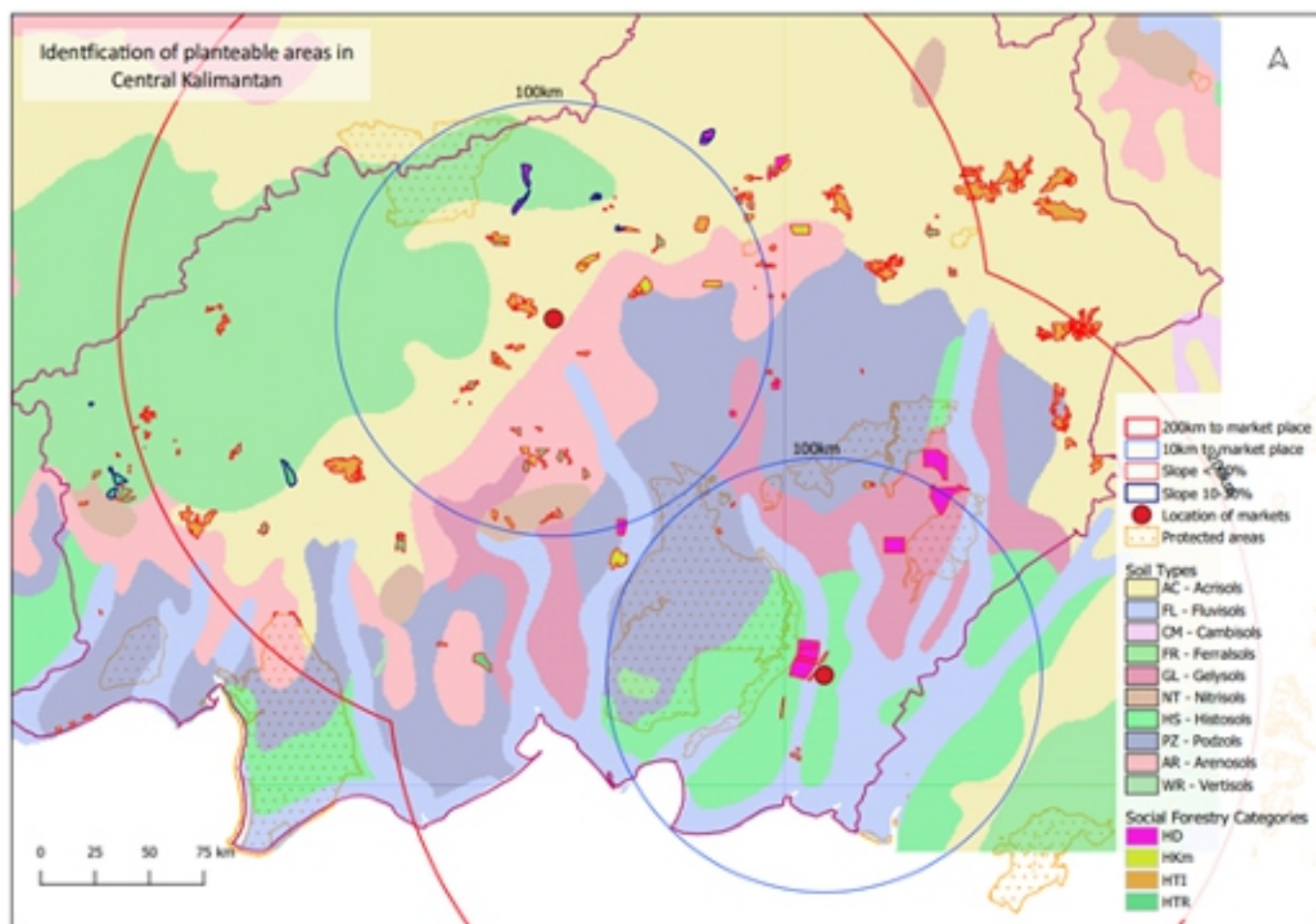
3. Economic Criteria

Finally, economic criteria should ensure that smallholders and investors will realize an attractive return on their multi-year investments. Scaling will only be possible if the farmers and investors are convinced of the viability of the model. For any forestry operation, the costs of transporting harvested timber to market is a critical factor and represents a major challenge. Particularly in Kalimantan, infrastructure in many rural areas is still underdeveloped. Ideally, sites within 100 kilometers of markets should be chosen as otherwise transportation costs reach a not acceptable level. The establishment of a local processing industry is crucial, but therefore a minimum supply of logs is needed.

The authors estimate that there are more than 70,000 ha of land on Central Kalimantan in the program area that meet the legal, technical, and economic requirements for implementing the FV model. This area estimation is conservative as new timber processing facilities are expected to come online in the short-term, which will decrease distance to markets. And land tenure classifications can be changed through cooperation with the GoI.

Land tenure classification	<100km	100-200km	>200km	Total
HD	36,319	4,505	103	40,928
HKm	14,522	6,595	1,315	22,432
HTI	9,445	76,148	30,701	116,294
HTR	9,775	8,741	4,160	22,676
Total	70,061	95,989	36,280	202,330

Identification of planteable areas in Central Kalimantan

Legend:
- 200km to market place
- 10km to market place
- Slope < 10%
- Slope 10-30%
- Location of markets
- Protected areas

Soil Types
- AC - Acrisols
- FL - Fluvisols
- CM - Cambisols
- FR - Ferralsols
- GL - Gelysols
- NT - Nitrisols
- HS - Histosols
- PZ - Podzols
- AR - Arenosols
- WR - Vertisols

Social Forestry Categories
- HD
- HKm
- HTI
- HTR

Climate Benefits of the Fairventures approach

FLR is one of the most significant instruments to combat climate change and achieve the objectives of the UNFCCC Paris agreement. Findings from the project show that the restoration of one ha of degraded land with fast-growing lightwood trees can raise the carbon stock by 177 tonnes per ha in the long-term average - even when the planted timber is regularly harvested and replanted. With millions of ha of degraded land available, reforestation with fast-growing species can support the Government of Indonesia's big plans to reduce emissions, while establishing new sources of income for rural populations and providing sustainable and traceable materials to the country's timber processing industry.

If, for example, only the areas under the Social Forestry Indicative map are considered (12,7 Mio ha all over Indonesia), and the experiences of Fairventures that approximately one third of the area is suitable for reforestation is taken into account, 4,2 Mio ha could be reforested. This would result in an absorption of more than 700 Mio tonnes of CO_2, or equivalent to the emissions from all sectors in Indonesia over a time of more than 1,5 years.

5. Opportunities for the Lightwood Processing Sector in Indonesia

Reforestation of degraded land with fast growing tree species has an additional benefit not mentioned before - it provides a sustainable, traceable and legal source of large amounts of lightwood, a material in high demand in the Indonesian wood processing sector. Below, the report highlights existing products and new opportunities to develop the industry further.

Products Made from lightwood Today

There is a wide range of mostly board products manufactured in Indonesia today. About 300 companies are producing barecore, blockboard and plywood. The most common lightwood species used is Sengon (Paraserianthes falcataria) and Jabon. Most of these companies are barecore producers only. These products are mainly for export and used as material for furniture, doors and other panel products.

Bare core, glued pieces with a finger jointed frame, is one of the main products that is produced from Sengon in Indonesia. These boards are a commodity only with a very limited added value and low prices. Bare Core is exported in huge amounts and further refined from the industry in the sourcing countries

Block board consists of bare core with an additional surface of veneer or other materials depending on the applications. The main export destination is China and other Asian countries but also recent increasing demand from Arabic countries. Blockboard is mainly used for furniture and door applications. The product is further processed and diversified in the sourcing market
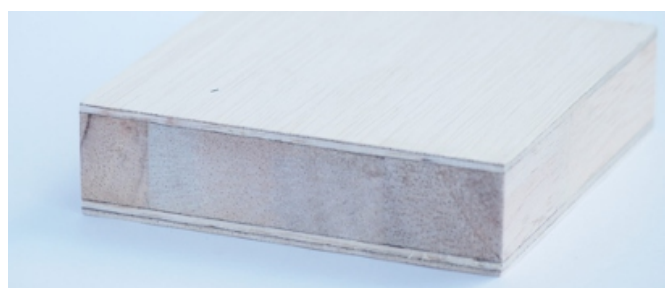
Plywood is another main product that is produced from Sengon in Indonesia. It consists of at least three layers of veneer. These layers are cross-laminated to each other. This creates a homogenization of the product, improving volume stability and decreasing directional dependency. The main export destinations are China, Japan, USA and Europe. Plywood is mainly used for furniture applications.
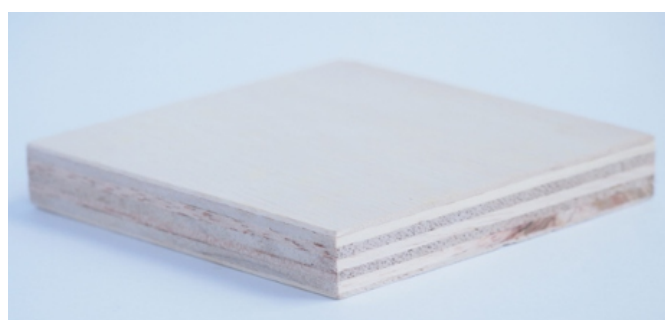
Upcoming Important Engineered Timber Products

Timber construction materials are new products for the Indonesian Lightwood sector. More and more companies are shifting towards becoming construction supply manufacturers. Lightwood is predestined as a timber construction material in the form of Laminated Veneer Lumber (LVL), Glulam and Cross Laminated Timber (CLT).

Glulam is a relatively new product manufactured in Indonesia. There are few companies producing Glulam from native hardwood. During the last few years, many companies initiated product innovation with lightwood developing Glulam. It is a beam consisting of finger jointed wood pieces. The product is used as a structural part and can replace steel or concrete. Glulam is used for a range of applications. Small-scale Glulam is used for furniture, whereas large-scale Glulam finds its place in timber constructions. Glulam can span large widths and secure heavy weights due to its high density.

Laminated Veneer Lumber (LVL) is an engineered wood product made from several layers of veneer glued together to a beam. In contrast to plywood, the layers of LVL are all assembled towards the same direction, not diagonal to each other. This increases the product's Modulus of Elasticity and traction. Furthermore, the layers are thicker than those of Plywood. Similar to Glulam, LVL is mainly used as a construction material for beams and posts.

Cross Laminated Timber (CLT) is a board developed to build houses. It is similar to plywood but consists of solid sawn timber instead of veneer. The layers are vertical or cross glued to each other. Outer layers usually have the same orientation. This way, CLT normally has three, five or seven layers. CLT is gaining popularity within timber construction due to its modularity and high degree of prefabrication. The different board layers can be arranged in a way that no cutouts are needed to accommodate doors or windows. This saves valuable material. CLT serves as a main structure material while additionally offering a high-quality thermal performance.

These innovative products have been presented at the Indonesia International Trade Expo in Jakarta in 2016, 2017, 2018 and 2019 and have strongly resonated with the visitors, among the President of Indonesia Joko Widodo.

The Transformation of the Building Sector will Lead to Increased Demand of Engineered Timber from Lightwood

Looking at the global mega trends, it becomes obvious that urbanisation will be an increased pressure point in the years to come. The United Nations (UN) is projecting that by 2050, around 68% of the global population will live in urban areas. This will likely lead to an increased demand for green construction products as most cities are yet to be built. Renowned climate scientists like Professor Hans Joachim Schellnhuber (PIK Germany) have recently identified the timber construction sector as the main driver to transform the construction sector to carbon neutrality. This will raise awareness among policymakers and foster timber construction.

So far, the construction sector is a major polluter. According to the World Green Building Council, the whole building sector combined accounts for 39% of global CO2 emissions. Steel and concrete alone are responsible for a combined 11%. The remaining 28% originate from energy used for heating, cooling and lighting buildings. The projected increase of demand within construction most probably amplifies these numbers even further. Sustainable and innovative alternatives for the building sector are crucial. There is a big potential in using Indonesian lightwood to satisfy increased demand. In the new State of the Union Speech (September 2020) from the Head of the European Commission, there is a significant passage talking about a new Bauhaus movement. Significant reduction of GHG emissions in the building sector is only possible if the utilization of timber is massively increased. Grey building material needs to be replaced by wood. The use of wood would also contribute to lowering emissions from heating and cooling as timber insulates better than concrete.

Another application that Fairventures Worldwide is looking into is for façade and roof materials. In such regard, Fairventures Worldwide is currently pioneering the development of prefabricated tropical shingle wood roof systems. The team tests the use of locally grown timber species from Central Kalimantan for innovative and smart roofing and façade systems. Wood shingles, as a type of façade or roof cover, are still commonly used in central Kalimantan until today. Nonetheless, the main wood species used for such matters are highly durable and oftentimes protected species such as ironwood (Eusideroxylon zwageri) which needs to be replaced urgently.

China has developed its new Timber Construction Code GB50005-2017 and a new regulation to increase the utilization of timber in public buildings. China has no significant own forests and therefore needs to source additional timber from tropical countries like Indonesia.

Indonesia is the first country in the world that has organized its forestry sector according to the EU FLEGT regulations. This makes timber sourced from Indonesia more attractive compared to other tropical countries.

In summary, the construction sector shows a big potential for adoption of more sustainable and innovative construction materials. Fairventures Worldwide is actively working on the development of lightwood products that can be used for the built environment. Ultimately, the aim is to add local value for smallholders through added value products, as well as addressing global climate change through the implementation of sustainable construction materials.

Challenges

1. Lack of Specific Know-How in the Timber Construction Sector

Indonesia has a long history in wood processing and building with wood. Especially Java, Sumatra, and Borneo are home to many skilled workers within the industry. A small number of vocational schools educate carpenters and joiners. These developments allow us to remain hopeful, building on a solid base within the wood processing industry. Nonetheless, challenges remain. In particular, entrepreneurs experience difficulties trying to find engineers who can work in wood manufacturing. This is due to the lack of specific wood engineering education in Indonesia. Additionally, the industry risks shortcomings due to a lack of skilled middle managers. These, however, are essential to drive necessary innovation. This lack could endanger the innovation process, limit production capacities and inhibit the production of added-value products.

2. From Deforestation to Afforestation

At the moment, the government has put a ban on the establishment of new palm oil concessions. It promotes social forestry and wants to transfer the management of 12,5 Mio ha of forest to local communities. This is a unique opportunity for the wood manufacturing industry to move forward on a sustainable basis. The industry with its sourcing policy can become the game changer. If this transfer succeeds, the Indonesian wood manufacturing industry will work to a large degree with communities. This enables income generation and livelihoods for rural communities all over Indonesia.

3. First Country in the World Able to Sell EU FLEGT Licensed Forest Based Products

Indonesia was among the countries with the highest deforestation rate between 1990 and 2010. Consequently, it held a negative reputation regarding the environmental conditions of timber production. It is all the more astonishing, that it has now adopted the most advanced tropical timber legality verification system and has become the poster child of the EU Forest Law Enforcement, Governance and Trade (FLEGT) process. This proves that the government has changed its outlook on forests and provides a huge competitive advantage for companies. Importers in the EU do not need to use unfamiliar due diligence systems since the Indonesian systems V-Legal or SVLK are accredited by the European Union. This massively reduces the risk of buying illegally sourced timber - stimulating an expected increase of timber exports. The government has made V-Legal mandatory for all exports, even though the system was established in cooperation with the EU, who only receives ca. 10% of Indonesian wood exports. It is crucial that the stakeholders in Indonesia see this system as an advantage and seriously further improve the system.

4. Added Value Products

Until now the key shares of the Sengon products are commodities (barecore), which are exported to China without added value. China produces added value products (by applying veneers and top layers), and thereby reaps an additional 100% added-value. There are some very successful Indonesian companies catching up with China already. It is absolutely possible to add value to the barecore in Indonesia. Collaboration in the sector with support from the government is key.

Processing and Added Value in Central Kalimantan

The decline of the timber industry in Central Kalimantan over the last decade is a consequence of the lack of raw materials from sustainably managed forests. It resulted in an under-valuation of the remaining forest land. This poses a great threat to the remaining forest. Deforestation and transformation of forest land into agricultural or industrial land use grow more likely.

At its core the Fairventures model integrates local farmers into the value chain of agroforestry products - most notably of fast-growing species like Sengon and Jabon. The first fields will soon reach harvest maturity. Previously conducted studies show that the transportation of timber logs from the plantation sites to the industries in Java is extremely expensive and additionally would cause a lot of emission due to the transport. This necessitates the establishment of a timber pre- processing industry in Central Kalimantan. Recent investments in large plywood production facilities confirm that the approach is promising. The industry demands the raw materials from the Sengon plantations to produce lightwood product.

Interviews with industrial manufacturers from Java provided insight into the most suitable products, of which veneer is the most suitable starting point. The main distinctions for the veneer for plywood are the gradings and the veneer orientation. Shipping Veneer instead of Logs could reduce transportation costs by about 70% and therefore make the rural areas in Kalimantan as planting sites competitive.

Besides the Veneer product itself, veneer trimmings, cut offs, peeler cores and fiber material from thinning could be transformed into Biochar. Biochar is a highly requested product on different markets for various applications, e.g. industrial uses, agriculture, and carbon trading. The Biochar processing machinery produces heat and electricity which then can be used as process heat for the drying process and the electricity for the facility.

Besides timber, the lightwood growing areas offer additional opportunities to supply valuable resources to the processing sector. The lightwood trees allow for intercropping between the tree rows with vegetables or cash crops. Fairventures Social Forestry has built a pilot drying facility at site and will shipp processed products to Java. One example is cocoa, which will be processed and marketed as "Rainforest Chocolate", generating income for farmers and telling the story of sustainable production of raw materials in Borneo.

Remaining secondary forests can be used as well through enrichment plantings with plants such as Bamboo or Rattan. This approach provides value to forests and opens up new and exciting spaces for raw material production. Fairventures has conducted first tests together with a German and an Indonesian company producing parts for the car industry which replace plastic materials. The preprocessing can be accomplished in Kalimantan, with refinement and processing into semi-finished products in Java. With the ever increasing trend towards natural materials, Indonesia is well positioned to take advantage of its favorable climate and large forest landscapes.

6. Recommendations

The project consisted mainly of a feasibility study, and as such has gathered and analysed information on topics as wide-ranging as forestry, the legal environment and the timber sector. Based on the analyses made, the project team has prepared recommendations to different stakeholder groups that would simplify and speed up the scale-up of Forest Landscape Restoration in Indonesia.

Recommendations to the Ministry of Trade (MOT) and others in Timber Processing Industry Development

The Ministry of Trade has recognized the potential of fast-growing lightwood tree planting and processing, and the role that this sector can play to further economic growth, trade and employment in Indonesia - supporting the transition towards a green economy. This report finds five key recommendations to MOT:

1. Communication & Collaboration
   MOT could expand its improvement through linking the processing industry with afforestation efforts in order to raise the planters' attention to the specific industry demands e.g. type and quality of lightwood.

2. Universal Norms
   MOT could amplify their improvements along the timber value chain through the introduction of universal timber construction norms. This would incentivize even more targeted reforestation with adequate guidelines and information and would have the potential to transform the building sector.

3. Showcase & Attention
   MOT's achievements require increased attention. Therefore, we suggest a lighthouse project in Jakarta, at the most attractive place possible, to show the potential of timber construction. This will attract the attention the industry deserves.

4. Stakeholder Facilitation
   MOT's great improvements have the potential for cross-fertilization. Therefore, MOT should initiate regular facilitation of Know-How exchange between the various stakeholders e.g. Ministry of Trade, schools, associations, companies, architects, and engineers.

5. Due Diligence System
   The combined efforts of MOT need to be recognized and remain uncompromised. Therefore, ongoing strict implementation of SVLK is necessary to maintain trust in the light wood value chain.

Recommendations to Ministry of Environment and Forestry and others Stakeholders of Forest Landscape Restoration

FSF's experience regarding the permit process and the partnership with the community was that all involved government agencies on the national (MOEF, BPSKL) and provincial level (FMU (KPH), Dinas Kehutanan) have been extremely helpful and were clearly interested to see Social Forestry succeed. However, since the social forestry regulations are still new and relatively untested, regulatory gaps and challenges remain. This report finds three key recommendations to the MOEF:

1. Stronger Partnerships
   We believe that a roundtable on social forestry between the involved ministries and agencies would be able to harmonize regulations and unleash the potential of social forestry areas, especially with regards to Foreign Direct Investments into social forestry partnerships.

2. Extend Decision-making Capacity
   The establishment of Forest Management Units was a huge policy success for the MOEF. Strengthening the capacities of the FMUs over the next years is a crucial step to realize their potential to improve forest governance and spearhead forest landscape restoration efforts. The FMUs would benefit from extended decision-making capacity regarding the implementation of social forestry, for example in regard to logging permits, heavy equipment entry permits, road construction permits and other decisions that impact the successful implementation of Social Forestry.

3. Contact Person & Guidance
   Social forestry permit-holding communities could benefit greatly from a civil servant as a dedicated person of contact pre- and post-process, who helps them to socialize the concept of SF with the local population and community leaders, navigate the process and could direct them to other valuable government resources where needed (such as legal or financial advice)

Recommendations to Investment Authorities and Indonesian Government Funding

The Indonesian government has made tremendous progress to improve the business climate and attract foreign direct investments to support Indonesia on its way to become one of the most powerful economies in Asia. The land use sector plays and will continue to play a significant role in the Indonesian economy. This report issues the following recommendations to realize the enormous potential in restoration:

1. Coordinating Stakeholders
   Different government programs have successfully tackled challenges in the regulatory environment and provide funding to restoration activities on different levels. Foreign investments can now be directed to the forestry and agricultural sector. However, many of these government programs could benefit from harmonization and improved coordination between the involved agencies and ministries, both on the national level and regional and local levels.

2. Capacity-building to facilitate access to support
   Capacity building, including socialization and centrally provided information, would improve access to government support for actors, who would benefit most prosperously, such as village governments and local businesses.

3. Early-stage Consultation for Communities
   Funding is often only available once a legal structure and business case or management plan is available. Communities struggle most with this part, and would thus benefit from early-stage consultation, funding and support provided before they have established structures (such as cooperatives, community-led businesses and partnerships with companies).

4. Include Agroforestry in Licensing Standards
   Agroforestry, the combination of trees and other crops on the same area, is one of the most prevalent systems of land use among smallholders in Indonesia. Equally, agroforestry is a promising system for sustainable business models. Business licenses from BKPM, however, only cover forestry or agriculture. Allowing agroforestry systems under a single licence would make the establishment of successful businesses much easier.

5. Regulating the Distribution of Carbon Benefits
   Climate finance, i.e. the certification of carbon stock, is another promising funding model for reforestation. A regulation on the distribution of carbon benefits between the government of Indonesia and (foreign) investors in forestry would open new opportunities for restoration funding.

Recommendations to Private Sector (Timber Processing Companies)

The timber processing sector in Indonesia contributes strongly towards employment, value addition and exports. Furthermore, the sector has initialized the transition from hardwoods from natural forests towards working with fast-growing light wood. A number of companies have introduced innovative products with a high potential for application in the domestic building sectors and for regional as well as international export. To build on these successes, this report finds five key recommendations to the private sector:

1. The Global Market
   Keep observing the timber construction sector worldwide in order to facilitate opportunities.

2. Alliances & Coalitions
   Build strong alliances along the value chain, integrate the operations with growers, and build strong relations with demand markets.

3. Sourcing
   Source Wood only from reliable sources in order to build trust amongst all stakeholders, from the source to the final client (Deforestation free end products).

4. Innovation & Capacity-building
   Invest in Innovation, build Know-How and create an innovation team within the company.

5. Future Opportunities
   Start with LCA (Life Cycle Analysis) and make the production facilities carbon-neutral to prepare for upcoming opportunities.

Recommendations to Public Donors & Investors

Forest Landscape Restoration (FLR) has matured into one of the most promising tools in the international adaptation to climate change. Public donors and, increasingly, private investors seek to amplify ongoing efforts on the ground by targeting grants and investments to restoration projects at different stages - from concept-testing to commercial scale-up.

Forest Landscape Restoration can be implemented under economically viable investment-driven models. These models are subject to risks resulting from a certain unpredictability of the natural environment, complex stakeholder models involving investors, implementers, government and local communities, and not yet fully developed infrastructure in the remote locations ideally suited for restoration projects.

The public sector has a strong interest to see forest landscape restoration succeed due to the benefits for rural incomes, climate change mitigation and biodiversity conservation. By supporting restoration projects with a clear commitment to build investable models, the public sector can guide and facilitate the involvement of the private sector.

Public funding is crucial to overcome the initial challenges and shoulder the risks that the private sector is not able and willing to take on by itself. Thereby, public funding can serve to pave the way for private investments with risks on an acceptable level for the private sector to step in.

Public funding would be most effective, if the private sector funds and investors would define clear conditions when it would be acceptable for them to invest, and attach themselves to projects early stage with clearly defined milestones, which, when reached, trigger initially small, then successively larger private investments.

Thus, the public and private sectors could work hand in hand to build a pathway for any viable project to progress from feasibility to pilot implementation to scaling with easy to access and pragmatic matching funding instruments at each step.

7. Outlook

Fairventures has gathered much experience through this project and is committed to support the Indonesian government in the rollout of Forest landscape Restoration through the Social Forestry Initiative and to the development of a mass timber construction sector in Indonesia.

The next steps for Fairventures are the development of the FSF pilot case until the first harvest to deliver proof of its viability. In parallel, Fairventures will analyse and distribute all information coming out of its experiences to inspire and encourage other companies to replicate and reproduce the Fairventures model. FSF itself will start operations on additional areas over the coming years.

On the value chain side, Fairventures will support the establishment of nurseries and processing facilities in Central Kalimantan and convince Indonesian companies to follow suit. In parallel, Fairventures will continue the conversation with the provincial government of Central Kalimantan regarding the development of suitable infrastructure to support reforestation and make additional areas available. Fairventures will also continue to work on the development of a timber building code together with partners from government and private sector, to realize the enormous potential in the building sector in Indonesia.

Conceptually, a few key questions need to be answered: Besides the trees identified in the project, which are the priority trees to be used in reforestation, that are well suited to planting and valuable to the industry? What would be a fair model of benefit sharing regarding carbon sequestration between the Indonesian government and foreign investors? And how can reforestation be integrated better with land use planning in the wider landscape, for example in regard to biodiversity corridors? Answering these questions will strengthen the case for FLR even further.

And last but not least, Fairventures will continue to prioritize capacity building on all levels, from farmers to companies and serve as a resource to the Indonesian government regarding social forestry implementation and timber sector development.

Description of IKI project (From FVW project summary)
Clearance and transformation of primary forests for agro-industrial production (particularly palm oil) in Kalimantan is responsible for high carbon emissions and has drastic effects on biodiversity and ecosystem services. After only a few planting cycles, soils are left heavily degraded and barren. The current challenges include the need to halt forest loss along buffer zones and to rehabilitate large deforested areas.

With the use of the native species Albasia (Paraserianthes Falcataria, Indon. Sengon), the aim of the project is to rehabilitate heavily degraded areas whilst creating an economically profitable land-use alternative to the establishment of palm oil plantations. At the same time, the project will focus on the restoration of ecosystem services alongside the improvement of the rural population's economic situation.

Within the framework of this feasibility and demonstration study, Paraserianthes f. will be planted in cooperation with communities and smallholders on an area of at least 300 ha within different systems. In the process, different silvicultural approaches will be tested and optimized, and marketing opportunities along the value chain will be identified and explored. In cooperation with industrial partners on Java, innovative products made from lightwood species will be developed and communicated to the wood processing sector.

The project was extended twice, the first project extension focused on the development of a concrete scaling case aligned with the Indonesian government's Social Forestry Initiative and has resulted in the establishment of Fairventures Social Forestry and the implementation of the first pilot case covering 4,000 ha and funded by private investors. The second project extension covered two topics: first, the development of timber sorting criteria for Sengon and the establishment of an online resource platform on lightwood processing (lightwood.org) and second, improving and extending the restoration approach in regard to logistics, processing and the test of intercropping lightwood with palm oil. This project is part of the International Climate Initiative. The Federal Ministry for the Environment (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

Fairventures Worldwide gGmbH
Fairventures Worldwide is a non-profit organization based in Stuttgart. We combine forestry and modern technologies to reforest degraded areas in the tropics. In cooperation with smallholder farmers in Indonesia and Uganda, we create sustainable forests that provide timber and food. This holistic approach secures an income for the local people, contributes to the preservation of biodiversity and counteracts climate change.

Together with partners from the private sector and educational institutions, we combine reforestation with sustainable value chains in the timber industry to replace climate-damaging building materials such as concrete, cement and steel. We finance our work with donations, grants, corporate corporations and consulting services. We work with our international and interdisciplinary team throughout Europe and in country offices in Indonesia and Uganda.

Unique Forestry and Land Use GmbH
UNIQUE is an international consulting firm for sustainable forestry and agriculture, rural development and natural resource management. The company was established in 1998 and is headquartered in Freiburg, Germany. Offices in Paraguay, Vietnam, Ethiopia and Kyrgyzstan and representatives in Argentina, Colombia, Uganda, UK and Serbia are strengthening our regional presence. With more than 20 years of experience conducting advisory services, analytics and investment support, we enable our clients to tackle successfully their technical, socio-economic, and organizational challenges in the land-use sector.

Our know-how is in demand worldwide from a broad variety of clients. We work with development banks, multilateral organizations, investment funds, ministries, municipalities, associations and the private sector. Since the company was founded, we have successfully completed more than 800 projects in about 75 countries. The international orientation of UNIQUE ensures that our clients have access to knowledge and experience from all over the world. In Paraguay, our subsidiary UNIQUE Wood manages more than 17,000 ha of FSC®- certified forests.

Borneo Institute
Borneo Institute is a Non-Governmental Organization organization founded by Dayak youth in Central Kalimantan in 2006. Borneo Institute is active in advocacy, social, environmental, cultural and educational activities. In 2014, the Borneo Institute has launched the One Million Trees program together with Fairventures. This program has involved farming communities in three sub-districts of Gunung Mas district, namely, Manuhing, Manuhing Raya and Rungan Barat with nearly 1000 assisted farmers and 16 farmer groups spread across three sub-districts. . The assistance includes the formation and empowerment of farmer groups, growing vegetables and fruit, trees like sengon and jabon, and other local timber species.

The founders of the Borneo Institute come from various professions who of course care about the future of the Dayak people, the environment and the homeland in Central Kalimantan. With a strong determination the Borneo Institute is oriented towards research and empowerment of communities and farmer groups.