

SUSTAINABLE NATURAL FOREST MANAGEMENT IN THE TROPICS

Best practices and investment opportunities for large-scale forestry



Imprint

Sustainable Natural Forest Management in the Tropics Best practices and investment opportunities for large scale forestry

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Authors

UNIQUE forestry and land use GmbH

Markus Grulke, Patricia del Valle, Irene Calo, Eduard Merger, Gero Pawlowski, Nicolas Wittmann and Andrea Braun (layout and design)

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UNIQUE forestry and land use
Schnewlinstraße 10
79098 Freiburg
Tel.: +49 761-208534-0
unique@unique-landuse.de
www.unique-landuse.de

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Table of Acronyms

Acronym	Clarification
CSR	Corporate Social Responsibility
DBH	Diameter at Breast Height
DEG	Deutsche Investitions- und Entwicklungsgesellschaft (German EFDI)
EDFI	European Development Finance Institution
EIB	European Investment Bank
FAO	Food and Agriculture Organization of the United Nations
FSC	Forest Stewardship Council
HCV	High Conservation Value
IFC	International Finance Corporation
ILO	International Labor Organization
IRR	Internal Rate of Return
ITTO	International Tropical Timber Organization
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
MAI	Mean Annual Increment
MHD	Minimum Harvesting Diameter
NGO	Non Governmental Organization
NTFP	Non Timber Forest Products
PAYCO	Paraguay Agricultural Corporation
PES	Payment for Environmental Services
PPP	Public Private Partnership
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RIL	Reduced Impact Logging
SNFM	Sustainable Natural Forest Management
TIMO	Timberland Management Organizations
USD	United States Dollars
WRI	World Resources Institute
From the Executive Summary in Spanish:	
AVC	Alto Valor de Conservación
EIR	Extracción de Impacto Reducido
IMA	Incremento Medio Anual
MSBN	Manejo Sostenible de Bosques Naturales



EXECUTIVE SUMMARY

Background

Natural tropical forests cover more than 1.6 billion hectares (ha) in 65 countries, more than half of which are primary forests. Although deforestation has decreased in some countries, rates of deforestation and forest degradation remain at high levels. Even though a significant area of current natural forests will be converted into other land uses in the future, it can be assumed that the most important part will remain as natural forests in different stages of degradation. Given this enormous area, achieving the sustainable management of natural forests is of utmost importance. Natural forest management represents a close-to-nature land use which can balance economic, ecological and social objectives through generating value, maintaining natural capital and ensuring the provision of different ecosystem services. This study aims at investigating best practices in sustainable natural forest management (SNFM) implemented by large-scale companies in the tropics and subtropics. It combines a comprehensive literature review with a survey collecting primary data from 51 companies and in-depth field visits to six selected companies. On the basis of the findings, main challenges and concrete investment opportunities for promoting SNFM are discussed.

Literature review

Silvicultural concepts and practices

Extensive research, especially in the 1980s and 90s, resulted in a set of SNFM concepts, which can be divided into two general approaches. (1) Polycyclic systems, which maintain the multi-layer, multi-age structure of natural forests, represent the most common approach in the tropics. The most frequent practice is selective logging based on minimum harvest diameters; whereas the approach with the highest impact on the productivity and quality of the forest is future / potential crop tree management (growth can be increased by 50% or more). (2) Monocyclic approaches, aiming for a homogenous forest age structure, such as shelterwood and enrichment systems, are less frequent in the tropics. As for technical aspects, reduced impact logging (RIL) is widely accepted as the most relevant tool to support SNFM. RIL can be defined as intensively planned and carefully controlled selective timber harvesting conducted by well trained workers in ways that minimize the deleterious impacts of logging.

Timber production

For most natural forest management companies, timber constitutes the key revenue stream. As a result of different site conditions and applied silvicultural practices, mean annual increment (MAI) values range between 1 and over 15 m³ per ha per year. However, this value, which includes all tree species, is of limited explanatory power in terms of economic performance because forest companies normally sell only between 10 and 20 different tree species, and in most cases 1 to 5 tree species are responsible for the major turnover of the company. Just like MAI, logging intensity also varies significantly among forests. Assuming common intervention cycles of 20 to 40 years, yields range between 0.5 to 2.5 m³ of commercial log volume per ha per year. Hence, the yield is low when compared to MAI values. Nevertheless, MAI and yield comparisons are difficult due to varying understanding of concepts.

Economic performance and markets

Internal rates of return from natural forest management projects may vary from even negative returns in unfavorable conditions under poor management to 15 % and more in rich forests under professional management. Assuming average conditions, construction and maintenance of infrastructure (mainly forest roads) and the purchase of forest estates are the most important factors influencing profitability. Case studies show improved economic performance for companies that include further timber processing in their activities. With regard to timber markets, tropical hardwood accounts for 12 % of total roundwood production globally. Main production areas are the Amazon region, the Congo basin and South East Asia, whereas processing and consumption focuses on North America, Europe and Asia (i.e. China and India). Tropical hardwood is not traded as an international price-based commodity. The recorded prices for quality saw or veneer logs vary between 80 and 300 USD per m³. In some cases (Mahogany, Myanmar Teak) prices can go up to 1,000 USD per m³ or more. There is a global trend of growing demand for tropical hardwood from natural forests at the same time that global production decreases, and prices for tropical sawn timber have seen a steady increase over the past 15 years.

Environmental aspects

SNFM is widely discussed as an option for conserving tropical forests, from an economic perspective, as well as maintaining ecosystem resilience, productivity and health, and biodiversity. Studies show that, on average 76 % of carbon stock is retained



and that 85 to 100 % of species remain in well-managed production forests. Furthermore, SNFM includes the delineation and management of protected areas as part of the entire managed area. In the late 1990s, the Forest Stewardship Council® (FSC®) adopted the high conservation value (HCV) concept as part of its principles and criteria, to properly address the management of areas with outstanding environmental and social values.

Socio-economic aspects

The socio-economic dimension of SNFM relates, on the one hand, to the direct employment generated. This includes proper qualifications, promotion of steady and local job generation, fair remuneration, appropriate living conditions, and special attention to health and safety. On the other hand, SNFM implies interaction with the local population. This interaction can bring significant positive impacts but, if not managed properly, it can harm populations and the company. The integration of the local population into project activities and equitable benefit sharing is a key component of SNFM. Partnerships need to be based on four major success factors: mutual respect, trust, practicality and communication.

Empirical assessment

General characteristics of surveyed forest companies

Information was collected from 51 forest companies (out of 187 contacted) managing large areas of natural forests in the tropics and subtropics, all them operating under FSC® or PEFC (Programme for the Endorsement of Forest Certification) certification. Surveyed companies cover a wide range of characteristics. About half of them (24) are located in Latin America, and the other half is distributed among Africa (12) and South East Asia (15). Companies manage different types of forests, rainforest being the most frequent; the initial state of the forests managed varies from untouched to heavily degraded. Seventy percent of companies have concession rights over the forest area, whereas the rest of them own the forests. User rights range on average from 16 to 45 years. The total area and net production area are very variable, with values ranging from less than 1,000 ha to up to over 1.5 million ha in some cases.

Silvicultural concepts and practices

All surveyed companies apply polycyclic systems and the widespread use of RIL is confirmed by survey findings: Most companies apply best practices concerning planning, forest operations and monitoring. However, less than 20 % of companies apply silvicultural treatments targeting the enhancement of productivity such as liberation thinnings or elimination of decaying trees. Furthermore, cooperation and exchange with other companies and research institutions is a common practice, and most companies allocate a budget for research and innovation.

Timber production

Most of the companies operate with intervention periods of 20 to 30 years. The number of commercial species is low and rarely exceeds 20 which highlights the challenge of marketing less known species: three quarters of all companies try to commercialize such species and half of all companies assess this as a barrier. As for forest productivity, collected values vary greatly among companies. In general, 75 % of companies report MAI values below 5 m³ per hectare per year and harvested volumes between 20 and 30 m³ per hectare and intervention (which equates to around 1 m³ per hectare per year). The variability in intervention cycles and harvested timber volumes can be partly explained by natural diversity of biophysical conditions, but also by a lack of clarity in concepts and units, which makes it difficult to obtain comparably reliable data.

Economic performance and markets

Deriving benchmarks for production costs and revenues proved difficult due to either lack of reliable data or reluctance to share them. However, some median values were derived:

- Harvesting operation costs: 30 USD per m³
- Silvicultural management costs: 15 USD per ha per year
- Transport costs: 20 USD per m³ and 100 km
- Administration costs: 28 USD per ha per year
- Log prices: 109 USD per m³

Supply chains, the market for natural timber and competition with plantation timber are assessed as success factors and reveal the existence of a well-defined market for timber from natural forests. Main barriers are related to timber prices, distance to markets and the competition with illegal timber.

Environmental aspects

Sixty-five percent of surveyed companies operate in high biodiversity environments and 68 % integrate biodiversity management into their operations. Nonetheless, restoration and conservation areas, representing 9 to 28 % of total managed area, are not seen as barriers to economic performance. Moreover, requirements for environmental impact monitoring are not seen as barriers, and are often met in cooperation with NGOs. Ninety percent of companies are actually endorsed by environmental organizations. Negative impacts on HCV forests appear to be uncommon, however the data are often unavailable. Annual expenses targeting environmental protection range from 120 to 520 USD per 1,000 ha of total area.

Socio-economic aspects

Permanent employment generated per 1,000 ha of net production area varies between 1 to 7 workers. The availability of skilled staff is a decisive aspect for companies. Most companies allocate a budget for training and capacity building (half of the companies invest 10 to 100 USD annually per permanent employee). The main driver of migration of workers relates to difficult working conditions. As for local populations, the number of affected people is highly variable among companies and includes indigenous peoples in two thirds of cases. Significant efforts are made by companies to promote socio-economic development (half of the companies invest 50 to 800 USD per 1,000 ha per year). Despite this, the real impact of such activities remains questionable in many cases, and the relationship with local communities is often seen as barrier to economic performance, mainly due to risks posed by illegal logging and encroachment on production areas. On the other hand, community groups and cooperation with external organizations are success factors.

Challenges

Opportunity costs of sustainable natural forest management

SNFM can only economically compete with more intensive land uses, like agricultural production or plantation forestry, in very specific conditions where opportunity costs are relatively low, such as remote areas, land with low potential for agriculture and on land legally classified for forestry use. Survey results confirmed this, with over 70 % of the companies stating that their forest land is unsuitable for agriculture or that forestry is the only legally permissible land use. In most other circumstances, natural forests can only be preserved by political will. Nevertheless, professional natural forest management and intelligent restoration concepts are crucial for conserving natural forests as an important landscape element and for providing raw material to the increasing timber product markets.

Enhancement of productivity

Enhancing forest productivity is a key factor for ensuring sustainability and strengthening the competitiveness of natural forest management. However, although silvicultural measures with proven positive impacts are available, only a few companies implement them. A main reason for this is a lack of incentives, as oversized areas and concession rights lasting less than the length of an intervention cycle render investments in consecutive harvests unnecessary. In addition, forest legislation is often outdated and not in line with sustainable practices, for instance the common prohibition of cutting trees with low diameters, which makes it difficult to promote future crop trees through thinnings.

Successful commercialization of forest products

A favorable market environment and market intelligence are crucial for the economic success of SNFM. The first main challenge in this respect relates to illegal logging activities, which account for 50-90 % of timber volume in key producer countries and 15-30 % globally. FLEGT (Forest Law Enforcement, Governance and Trade) and the Lacey Act can contribute to addressing this by limiting the marketing of illegal timber in export markets. The second main challenge relates to marketing secondary timber species. This has the potential to enhance economic performance and reduce forest degradation, but it requires time and resources for research. Furthermore, an option successfully realized by some companies is the integration of timber processing which ensures raw material supply and quality while diversifying the range of products. Last but not least, some companies generate revenue streams from environmental services, but in the overall picture payments for ecosystem services (PES) still do not play a significant role.

Governance and forest legislation: enabling environment

The forest sector has traditionally been very informal. This has a strong negative impact on the economic performance of companies applying SNFM and makes it difficult to attract international investors that are very sensitive to reputational risks. Governance and forest legislation define the framework in which forest companies operate. Aspects such as consistent land use planning and secure long-term use rights, as well as up-to-date legislation and streamlined procedures, are essential for promoting SNFM. Finally, international initiatives such as REDD+ and FLEGT are often perceived by companies as being still on a conceptual level, and these need to be adapted to real circumstances of companies to bring tangible effects.

Investment options

The private sector can play a huge role in financing SNFM and is increasingly interested in the forest sector. However, for the time being, investments in SNFM play only a minor role and are almost exclusively made by industrial investors linked to the forest sector, i.e. forest companies and timber processing / consuming industries. In order to promote SNFM at a significant scale, large commercial investors need to be attracted, for which successful cases and clear investment opportunities have to be identified, and reputational risks need to be mitigated. To achieve this, four main investment paths were identified that should be pursued in parallel to each other:

1. Investments in upgrading forest companies aiming to improve their SNFM practices. They should focus on increasing managerial and technical capacities, enhancing productivity through best silvicultural management, and purchasing modern technology and machinery to increase efficiency and reduce impacts. Given the relatively small ticket sizes, typically <1 million USD, the most suited investors are forest companies and impact investors, in particular where clear social and environmental benefits can be obtained.
2. Investments in upscaling SNFM through enlargement of successful companies and establishment of new ones. Such investments have a high impact potential, require large sums of capital (ticket sizes typically >5 million USD) and entail relatively high risks. Therefore, commercial investors with a respective mandate for such investments, mainly financial development institutions and development banks, are the most suited investor group to engage in this. In the long run, such engagement can pave the way for other commercial asset investors such as pension funds and investment banks, by creating successful track records and lowering perceived risks.
3. Investments in the value chain, through the combination of raw material production and processing facilities, ensure a continuous quality and supply of raw material, can improve the rate of return and offer more flexibility to react to market dynamics. Ticket sizes range from below one to several million USD and internal rates of return are typically above 15 %. This kind of investment is already being made by forest companies and commercial banks.
4. Investments in enabling environment to improve the legal framework in which forest companies operate. Achieving formalization and law enforcement are crucial to improving the performance of SNFM and to lowering political risk perceived by international investors. Financial support needed for improvement of forest governance is restricted to non-profit and impact investors and will therefore need to be covered by the public sector or NGOs.

Final remarks

SNFM is an intelligent close-to-nature land use option that generates value, provides raw material to expanding timber markets, and conserves biodiversity and carbon stocks. There are many good examples worldwide of forest companies doing an outstanding job and applying best practices. However, there are still barriers hindering an even better performance of SNFM. Main challenges identified relate to: i) addressing the informality of the forest sector and illegal logging activities, ii) enhancement of productivity through adequate silviculture, and iii) the expansion of the merchantable product portfolio of forest companies by marketing lesser known species and/or value chain integration.

To create productive and diverse landscapes and produce timber for the growing global population, SNFM will become more and more important in the future. However, the share of natural forest areas that are managed sustainably is still very low. To expand substantially the area under SNFM and to address the above-mentioned challenges, investments from the public and private sector are required. At present, the engagement of (commercial) investors in natural forest management is still limited, but there is an increasing interest. In order to foster this trend, public and private investments at different levels will have to go hand in hand.

RESUMEN EJECUTIVO

Antecedentes

Los bosques tropicales naturales abarcan más de 1.600 millones de hectáreas (ha) en 65 países, de las cuales más de la mitad son bosques primarios. A pesar de que la deforestación ha disminuido en algunos países, las tasas de deforestación y degradación de los bosques siguen siendo muy elevadas. Aunque una parte significativa de los bosques actuales será convertida en el futuro a otros usos del suelo, es posible asumir que la mayor parte seguirán siendo bosques naturales en distintos estados de degradación. Ante esta enorme área, resulta de extrema importancia alcanzar un manejo sostenible de los bosques naturales. Este manejo representa un uso de la tierra cercano a las dinámicas naturales, capaz de conciliar objetivos económicos, sociales y ecológicos, generando valor, manteniendo el capital natural y asegurando la provisión de los servicios ecosistémicos. El presente estudio se centra en el análisis de buenas prácticas de manejo sostenible de bosques naturales (MSBN) llevadas a cabo por empresas que operan a gran escala en zonas tropicales y subtropicales. El estudio combina una revisión bibliográfica intensiva con datos primarios de 51 empresas forestales encuestadas, información que fue complementada con la visita sobre el terreno de seis de estas empresas. En base a los resultados encontrados, se discuten los principales retos y se identifican oportunidades de inversión concretas para promocionar el MSBN.

Revisión bibliográfica

Conceptos y prácticas silviculturales

Los trabajos de investigación sobre MSBN, especialmente abundantes en las décadas de 1980 y 1990, dieron lugar a numerosos conceptos silviculturales, que pueden agruparse en dos enfoques generales. (1) Los sistemas policíclicos, que mantienen la heterogeneidad de capas y edades de los bosques naturales, representan el enfoque más común en los trópicos. El sistema aplicado con mayor frecuencia es la cosecha selectiva según diámetro mínimo de corta; mientras que el enfoque con el mayor impacto en la productividad y calidad del bosque es el manejo de árboles de futura cosecha (el crecimiento puede aumentar en un 50 % o más). (2) Los sistemas monocíclicos, que buscan una estructura homogénea de edades en el bosque, como por ejemplo distribuciones por rodales o sistemas de enriquecimiento, son menos frecuentes en los trópicos. En cuanto a los aspectos técnicos, la extracción de impacto reducido (EIR) está ampliamente aceptada

como la herramienta más relevante para apoyar el MSBN. EIR puede definirse como una cosecha selectiva planeada y controlada al detalle, llevada a cabo por trabajadores adecuadamente formados, de modo que se minimice el impacto de la cosecha.

Producción de madera

Para la mayor parte de las empresas que manejan bosques naturales, la madera constituye la principal fuente de ingresos. Como resultado de las distintas calidades de sitio y silvicultura aplicada, el rango de valores del incremento medio anual (IMA) puede variar entre 1 y más de 15 m³ por ha y año. Sin embargo, este valor, que incluye todas las especies arbóreas, es de escaso valor para explicar el rendimiento económico del manejo. Habitualmente, las empresas forestales comercializan solo 10 a 20 especies, y en la mayoría de los casos entre 1 y 5 especies son responsables de la mayoría de los ingresos generados. Al igual que el IMA, la intensidad de la cosecha varía significativamente entre bosques. Asumiendo ciclos de intervención comunes, de 20 a 40 años, el volumen de cosecha varía entre 0,5 y 2,5 m³ de madera en rollo comercial por ha y año, lo que muestra que el rendimiento es bajo en comparación con el IMA. No obstante, esta comparación es difícil de realizar debido a las distintas definiciones de ambos conceptos.

Rendimiento económico y mercado

Las tasas internas de retorno de los proyectos de manejo de bosques naturales pueden variar desde valores incluso negativos, en condiciones desfavorables y con un manejo deficiente, hasta 15 % o más en bosques ricos donde se aplica un manejo profesional. Asumiendo condiciones medias, los factores más relevantes que influyen la rentabilidad son la construcción y el mantenimiento de infraestructura (principalmente caminos) y la compra de terreno. Los casos estudiados muestran un rendimiento económico mejorado en las empresas forestales que incluyen el procesamiento de madera entre sus actividades. En cuanto a los mercados, la madera dura representa aproximadamente el 12 % de la producción global de madera en rollo. La mayor parte de las áreas de producción se concentran en la región amazónica, la cuenca del Congo y el sureste asiático, mientras que las áreas de procesamiento y consumo se centran en América del norte, Europa y Asia (principalmente China e India). La madera dura tropical no se comercializa como una mercancía basada en los precios internacionales. El registro de precios para ma-



dera aserrada o chapa varía entre 80 y 300 USD por m³ y en algunos casos (caoba, teca de Myanmar) los precios pueden superar los 1.000 USD por m³. La tendencia global indica un aumento de la demanda de madera dura de bosques naturales, al mismo tiempo que la producción descende, por lo que los precios para madera tropical aserrada han aumentado de modo continuo a lo largo de los últimos 15 años.

Aspectos ambientales

El MSBN ha sido discutido ampliamente como una opción para la conservación de los bosques tropicales, desde una perspectiva económica, así como para mantener la resiliencia del ecosistema, la productividad, la salud y la biodiversidad. Diversos estudios muestran que, en promedio, los bosques de producción bien manejados retienen un 76 % de las reservas de carbono y mantienen entre el 85 y 100 % de las especies. Además, el MSBN incluye la delineación y el manejo de áreas protegidas como parte del área de manejo total. A finales de la década de los 90 FSC® incluyó el concepto de alto valor de conservación (AVC) como parte de sus principios y criterios, para abordar correctamente el manejo de áreas con valores ambientales y sociales destacados.

Aspectos socioeconómicos

La dimensión socioeconómica del MSBN incluye por un lado, el empleo directo generado. Esto implica cualificaciones adecuadas, generación de empleo local estable, remuneración justa, condiciones de vida adecuadas, así como una atención especial a la salud y seguridad. Por otro lado, el MSBN implica la interacción con las poblaciones locales. Esta interacción puede tener impactos positivos muy significativos, pero si no se maneja correctamente puede perjudicar tanto a la población como a la empresa. La integración de la población local en las actividades de la empresa y una distribución equitativa de los beneficios es un componente clave para el MSBN. Estas alianzas deben basarse en cuatro factores de éxito fundamentales: respeto mutuo, confianza, funcionalidad y comunicación.

Evaluación empírica

Características generales de las empresas forestales encuestadas

La información fue obtenida de 51 empresas forestales (de un total de 187 contactadas) que manejan grandes áreas de bosques naturales en los trópicos y subtrópicos, todas ellas bajo

certificación FSC® o PEFC. Las características de estas empresas cubren un amplio espectro. Cerca de la mitad (24) opera en América latina, la otra mitad estando distribuida entre África (12) y el sureste asiático (15). El tipo de bosque manejado es muy variable, siendo la selva tropical el caso más frecuente, y su estado inicial va desde bosque virgen a bosque fuertemente degradado. El 70 % de las empresas tienen derechos de concesión sobre el área forestal, siendo el resto propietario de sus bosques; los derechos de uso oscilan entre 16 y 45 años en promedio. Igualmente, las áreas totales y áreas netas de producción son muy variables, con valores desde menos de 1.000 ha a más de 1,5 millones ha en algunos casos.

Conceptos y prácticas silviculturales

Todas las empresas encuestadas aplican sistemas policíclicos y los datos confirman un uso generalizado de EIR: la mayor parte de las empresas aplican buenas prácticas en planificación, operaciones forestales y monitoreo. Sin embargo, menos del 20 % de las empresas aplican tratamientos silvícolas destinados a la mejora de la productividad, como raleos de liberación o eliminación de árboles moribundos. Por otro lado, la cooperación y el intercambio con otras empresas e instituciones de investigación es una práctica común, y la mayor parte de las empresas dedican una parte de su presupuesto a investigación e innovación.

Producción de madera

La mayor parte de las empresas opera con ciclos de intervención de 20 a 30 años. El número de especies comerciales es bajo y raras veces supera las 20, lo que resalta el reto que supone la comercialización de especies menos conocidas: tres cuartos de las empresas intentan comercializar estas especies y la mitad de las empresas considera este aspecto una barrera. En cuanto a la productividad del bosque, los datos recogidos varían mucho dependiendo de las empresas. En general, el 75 % de las empresas indican un IMA menor a 5 m³ por ha y año y un volumen cosechado de 20 a 30 m³ por ha e intervención (lo que equivale aproximadamente a 1 m³ cosechado por ha y año). La variabilidad en los ciclos de intervención y volúmenes de cosecha puede ser explicada en parte por la diversidad natural de las condiciones biofísicas, pero también por una falta de claridad en los conceptos y unidades, lo que dificulta obtener datos comparables.

Rendimiento económico y mercado

La deducción de valores de referencia para los costos e ingresos de producción resultó ser una tarea complicada, debido en parte a la falta de disponibilidad de datos fiables, y en parte a cierta reticencia de las empresas a compartirlos. A pesar de ello, se han podido deducir algunos valores medianos:

- Costos de operaciones de cosecha: 30 USD por m³
- Costos de manejo silvicultural: 15 USD por ha y año
- Costos de transporte: 20 USD por m³ y 100 km
- Costos de administración: 28 USD por ha y año
- Precios de madera en rollo: 109 USD por m³

Las cadenas de suministro, el mercado de madera de bosques naturales y la competencia con madera de plantaciones son aspectos clasificados como factores de éxito por las empresas, lo que muestra la existencia de un mercado bien definido e interesante para la madera de bosques naturales. Las principales barreras se relacionan con el precio de la madera, la distancia a los mercados y la competencia con la madera ilegal.

Aspectos ambientales

El 65 % de las empresas encuestadas trabaja en lugares con alta biodiversidad y el 68 % de las empresas integra el manejo de la biodiversidad en sus operaciones. Las áreas de conservación y restauración representan entre el 9 y el 28 % del área total manejada, y no son consideradas como barrera para el rendimiento económico. Del mismo modo, tampoco son una barrera los requerimientos para el monitoreo de impactos ambientales, que muy a menudo se realiza en cooperación con ONGs. De hecho, el 90 % de las empresas están avaladas por organizaciones medioambientales. Los impactos negativos en bosques de alto valor de conservación no son comunes, aunque a menudo no hay datos disponibles sobre este tema. El gasto anual destinado a la protección ambiental varía entre 120 y 520 USD por cada 1.000 ha de área total.

Aspectos socioeconómicos

El empleo permanente generado por cada 1.000 ha de área de producción neta varía entre 1 y 7 trabajadores. La disponibilidad de personal cualificado es un aspecto decisivo para las empresas. La mayor parte de ellas dedica parte de su presupuesto para capacitación y formación (la mitad de las empresas invierten anualmente entre 10 y 100 USD por empleado permanente). La principal causa de migración de trabajadores está relacionada con las difíciles condiciones de trabajo. En cuanto a la población local, el número de personas afectadas es muy variable dependiendo de las empresas, y en dos tercios de los casos esta incluye pueblos indígenas. Las empresas han realizado esfuerzos significativos para el desarrollo socioeconómico (la mitad de las empresas invierten anualmente entre 50 a 800 USD por cada 1.000 ha). A pesar de ello, el impacto real de estas actividades es cuestionable en muchos casos, y la relación con comunidades locales es a menudo percibida como una barrera para el rendimiento económico, principalmente por los riesgos de tala ilegal e invasión en las áreas de producción. Por otro lado, la existencia de grupos en las comunidades y la cooperación con organizaciones externas se consideran factores de éxito.

Desafíos

Costos de oportunidad del manejo sostenible de bosques naturales

El MSBN solo puede competir económicamente con un uso de la tierra más intensivo, como agricultura o plantaciones forestales, en condiciones muy específicas, donde los costos de oportunidad son relativamente bajos. Este es el caso en áreas remotas, tierras con bajo potencial para la agricultura y tierras clasificadas legalmente para un uso exclusivamente forestal. Los resultados de la encuesta confirman esto: más del 70 % de las empresas constatan que sus bosques no son aptos para agricultura o que el forestal es el único uso legalmente permitido. En la mayor parte de los casos restantes, los bosques naturales solo pueden ser preservados si existe voluntad política. No obstante, el manejo profesional de los bosques naturales y los conceptos inteligentes de restauración son cruciales para conservar los bosques naturales como un elemento importante del paisaje, y para suministrar materia prima a un mercado de la madera creciente.

Aumento de la productividad

El aumento de la productividad del bosque es un factor clave para asegurar la sostenibilidad y mejorar la competitividad del manejo de los bosques naturales. A pesar de ello, y aunque hay disponibilidad de medidas silviculturales con impactos positivos probados, solo unas pocas empresas las implementan. Esto se debe principalmente a la falta de incentivos: al disponerse de grandes áreas de bosque y al ser la duración de los derechos de concesión menor a un ciclo de intervención, las inversiones en cosechas consecutivas resultan innecesarias. Además, a menudo la legislación forestal está desactualizada y no se adecua a las prácticas sostenibles, como es el caso común de la prohibición de extraer árboles de diámetros pequeños, lo que dificulta la promoción de árboles de futura cosecha mediante raleos.

Comercialización exitosa de los productos forestales

Un entorno de mercado favorable, así como la inteligencia de mercado, son cruciales para el éxito económico del MSBN. El primer gran reto a este respecto está relacionado con las actividades ilegales de cosecha, que representan un 50-90 % del volumen de madera en países productores clave, y un 15-30 % a nivel global. FLEGT y la ley Lacey pueden ayudar a afrontar este problema, limitando la comercialización de madera ilegal en los mercados de exportación. El segundo gran reto tiene que ver con el mercado de madera de especies secundarias. Este mercado tiene el potencial de aumentar el rendimiento económico y reducir la degradación forestal, pero requiere tiempo y recursos para investigar. Una opción realizada con éxito por algunas empresas es la integración del procesamiento de la madera, que asegura el suministro y la calidad de materia prima a la vez que se diversifica el espectro de productos. Por último, pero no por ello menos importante, algunas empresas generan ingresos por servicios ambientales; aunque a nivel general el pago por servicios ambientales todavía no juega un papel significativo.

Gobernanza y legislación forestal para crear un marco favorable

El sector forestal ha sido tradicionalmente muy informal. Esto tiene un fuerte impacto negativo en el rendimiento económico de las empresas que aplican un MSBN y obstaculiza la atracción de inversores internacionales, muy sensibles a los riesgos de reputación. La gobernanza y la legislación forestal definen el marco en el cual opera la empresa forestal. Aspectos como una planificación consistente del uso de la tierra y unos derechos de uso seguros a largo plazo, así como una legislación actualizada y procedimientos ágiles son fundamentales para promover el MSBN. Por otro lado, iniciativas internacionales como REDD+ y FLEGT a menudo son percibidas por las empresas como conceptos; estas deben adaptarse a las circunstancias reales de las empresas para que sus efectos sean tangibles.

Opciones de inversión

El sector privado puede jugar un rol fundamental en el financiamiento del MSBN y su interés en el sector forestal es cada vez mayor. Sin embargo, por el momento las inversiones en MSBN solo tienen un rol menor y son realizadas casi exclusivamente por inversores industriales vinculados al sector forestal, como empresas forestales e industrias que procesan o consumen la madera. Para promover el MSBN a una escala significativa, es necesario atraer a inversores comerciales, para lo cual es esencial identificar ejemplos exitosos y oportunidades claras de inversión, así como mitigar los riesgos que puedan afectar a su reputación. Para alcanzar este objetivo, se identificaron cuatro estrategias principales de inversión, que deben ser llevadas a cabo en paralelo:

1. Inversiones en la mejora de las empresas forestales y de las prácticas de MSBN que estas aplican. Estas inversiones deben enfocarse en el fortalecimiento de las capacidades gerenciales y técnicas, de modo que aumente la productividad mediante un manejo silvicultural mejorado, y en la adquisición de tecnología y maquinaria moderna, de modo que mejore la eficiencia y disminuyan los impactos. Dado el relativamente pequeño volumen de inversión requerido, normalmente menor a 1 millón USD, los inversores que mejor se ajustan a este tipo de inversiones son las empresas forestales y los inversores de impacto, particularmente en los casos en los que se pueden obtener claros beneficios sociales y ambientales.
2. Inversiones en la ampliación del MSBN a través de la ampliación de empresas exitosas y el establecimiento de nuevas empresas. Las inversiones de este tipo tienen gran potencial de impacto, requieren grandes sumas de capital (volumen de inversión normalmente superior a 5 millones USD) y conllevan riesgos relativamente altos. Por ello, los inversores más adecuados en este caso son los inversores comerciales con mandatos específicos para este tipo de inversiones, principalmente las instituciones financieras de desarrollo y los bancos de desarrollo. A largo plazo, su participación puede preparar el terreno para otros inversores comerciales, como los fondos de pensiones o los bancos de inversión, contribuyendo a crear casos exitosos y reducir los riesgos percibidos.

3. Inversiones en la cadena de valor, mediante la combinación de la producción de materia prima y las instalaciones de procesamiento. Estas inversiones permiten garantizar la calidad y el suministro de materia prima, mejorar la tasa de retorno y tener mayor flexibilidad ante las dinámicas del mercado. El volumen de inversión necesario puede variar desde menos de uno hasta varios millones USD y las tasas internas de retorno suelen superar el 15 %. Este tipo de inversiones ya son realizadas por empresas forestales y por bancos comerciales.
4. Inversiones en la creación de un entorno propicio para mejorar el marco legal en el cual operan las empresas forestales. Lograr la formalización y la aplicación de las leyes forestales es crucial para mejorar el rendimiento del MSBN y reducir los riesgos políticos percibidos por los inversores internacionales. El soporte financiero necesario para mejorar la gobernabilidad forestal está restringido a inversores sin ánimo de lucro e inversores de impacto, por lo que estas inversiones deben ser cubiertas por el sector público y las ONGs.

Consideraciones finales

El MSBN es una opción de uso de la tierra inteligente, cercana a las dinámicas naturales, que genera valor, suministra materia prima para el creciente mercado de madera y conserva la biodiversidad y las reservas de carbono. En el mundo existen numerosos ejemplos de empresas forestales que hacen un trabajo destacado y aplican buenas prácticas. No obstante, aún existen barreras que superar para mejorar el rendimiento del MSBN. Los principales retos identificados se relacionan con: i) abordar la informalidad del sector forestal y las actividades de tala ilegal, ii) mejorar la productividad a través de una silvicultura adecuada, y iii) ampliar la cartera de productos de las empresas forestales, comercializando especies forestales menos conocidas y/o integrando la cadena de valor.

Para crear paisajes productivos y diversos, y producir madera para la creciente población mundial, la importancia del MSBN será cada vez mayor en el futuro. Sin embargo, el área de bosques naturales que son manejados de modo sostenible sigue siendo muy baja. Para ampliar sustancialmente esta área y abordar los ya mencionados retos, son necesarias inversiones desde los sectores público y privado. En la actualidad, la participación de inversores (comerciales) en el manejo de bosques naturales es limitada, pero existe un interés creciente. Para promover esta tendencia, es necesario que las inversiones públicas y privadas a distintos niveles avancen a la par.

RÉSUMÉ

Contexte

Les forêts naturelles tropicales couvrent plus de 1,6 milliards d'hectares (ha) dans 65 pays, plus de la moitié sont des forêts primaires. Bien que la déforestation ait diminué dans certains pays, les taux de déforestation et de dégradation des forêts demeurent élevés. Malgré que la conversion d'une partie non négligeable des forêts naturelles actuelles en d'autres systèmes d'utilisation des terres soit prévue à l'avenir, on suppose tout de même que la part la plus importante restera une forêt naturelle à différents stades de dégradation. Compte tenu de l'immensité de cette surface, assurer une gestion durable des forêts naturelles revêt une importance capitale. La gestion des forêts naturelles signifie un système d'exploitation des terres en accord avec la nature, capable de mettre en équilibre les objectifs économiques, écologiques et sociaux à travers la création de valeur, la conservation du capital naturel et la fourniture de différents services écosystémiques. La présente étude a pour objectif d'analyser les meilleures pratiques, en matière de gestion durable des forêts naturelles (SNFM: sustainable natural forest management), mises en œuvre par de grandes entreprises dans les régions tropicales et subtropicales. Elle permet d'associer à un examen approfondi de la documentation disponible, une étude basée sur la collecte de données primaires issues de 51 entreprises puis une enquête de terrain poussée réalisée auprès de 6 entreprises sélectionnées. Sur la base des conclusions du rapport, les principaux enjeux ainsi que les opportunités concrètes d'investissement pour promouvoir les systèmes SNFM seront discutés.

Examen de la documentation

Concepts et pratiques sylvicoles

Des travaux de recherches approfondis, réalisés particulièrement dans les années 80 et 90, ont aboutis à la formulation d'un ensemble de concepts de SNFM, articulées en deux principales approches. (1) Les systèmes polycycliques, qui maintiennent une structure en patches de forêts d'âges différents et à strates multiples, représentent la méthode la plus communément utilisée dans les tropiques. La pratique la plus fréquente consiste en une coupe sélective qui impose un diamètre minimum pour les arbres à exploiter tandis que la méthode ayant l'impact le plus important sur la productivité et la qualité de la forêt est la gestion des arbres d'avenir (la croissance peut être augmentée de 50 % ou plus). (2) La méthode monocyclique, ayant elle pour objectif une forêt de structure d'âge homogène, en mode de régénération par coupes d'abri

et système d'enrichissement, reste moins fréquente dans les tropiques. Pour des raisons techniques, l'exploitation à faible impact (RIL: reduced impact logging) constitue la méthode la plus largement reconnue comme étant l'outil le plus pertinent qui soutient le système SNFM. La sélection à faible impact peut être définie comme un ensemble d'opérations de récolte sélective de bois qui ont fait l'objet d'une planification intensive et qui sont attentivement contrôlées et menées par des ouvriers qualifiés, afin d'en réduire l'impact négatif.

La production de bois

Pour la plupart des sociétés de gestion forestière, le bois constitue la source de revenus la plus importante. Selon les différentes conditions du site et des méthodes sylvicoles utilisées, on enregistre des valeurs d'accroissement annuelles (MAI : mean annual increment) comprises entre 1 et plus de 15 m³ par ha et par an. Cependant, cette valeur qui inclut toutes les essences, n'a qu'un pouvoir explicatif limité en termes de rendement économique puisque les sociétés forestières ne vendent qu'un nombre réduit - compris entre 10 et 20 - d'espèces d'arbres différentes. Dans la plupart des cas, une à cinq espèces seulement sont responsables de la part la plus importante du chiffre d'affaires de la société. Tout comme le MAI, l'intensité des coupes varie considérablement selon les forêts. En supposant des cycles d'intervention classiques de 20 à 40 ans, les rendements sont compris entre 0,5 et 2,5 m³ de volume commercial de récolte par ha et par an. De ce fait, le rendement est bas en comparaison avec les valeurs MAI. Cependant, comparer les valeurs MAI et celles du rendement sont difficiles à cause des interprétations différentes des concepts.

Performance économique et marchés

Les taux de rendement internes des projets de gestion des forêts naturelles peuvent varier d'un rendement même négatif, dans des conditions défavorables et un contexte de gestion déficiente, à 15 % et plus dans des forêts riches soumises à une gestion professionnelle. En supposant des conditions normales, la construction et l'entretien de l'infrastructure (essentiellement des chemins forestiers) et l'acquisition de domaines forestiers constituent les facteurs les plus importants influençant la rentabilité. Des études de cas montrent une performance économique améliorée pour des entreprises qui incluent plus la transformation du bois dans leurs domaines d'activités. Considérant le marché du bois, le bois tropical représente 12 % de la production globale des bois ronds. Les



principales régions de production sont l'Amazonie, le bassin du Congo et l'Asie du sud-est tandis que les régions se concentrant sur la transformation et la consommation de bois sont l'Amérique du nord, l'Europe et l'Asie (Chine et Inde). Le bois tropical n'est pas commercialisé comme une marchandise internationale basée sur le prix. Les prix enregistrés pour les grumes de sciage et de placage varient entre 80 et 300 USD par m³. Dans certains cas (pour l'acajou et le teck de Birmanie), les prix peuvent aller jusqu'à 1000 USD par m³ et plus. Il existe une tendance globale montrant une demande croissante des bois tropicaux provenant de forêts naturelles face à une diminution de la production globale et à des prix de bois de sciage ayant connu une augmentation permanente les 15 dernières années.

Aspects environnementaux

La question abordant le système SNFM en tant qu'option pour la conservation des forêts tropicales d'un point de vue économique mais aussi pour maintenir la résilience de l'écosystème, la productivité et la santé ainsi que la biodiversité, est largement débattue. Des études montrent qu'une moyenne de 76 % du stock de carbone est conservée et que 85 à 100 % des espèces restent préservées dans des forêts dont le système de production est bien géré. Le système SNFM inclut la délimitation des espaces protégées comme partie intégrante de la surface gérée. Par ailleurs, le FSC® a adopté vers la fin des années 90, le concept de haute valeur de conservation (HCV : high conservation value) comme part de ses principes et critères afin d'assurer une gestion convenable de territoires dotés de valeurs environnementales et sociales exceptionnelles.

Aspects socio-économiques

La dimension socio-économique des systèmes SNFM concerne d'une part, la création directe d'emplois qui inclue l'intégration de qualifications appropriées, la promotion d'emplois stables et locaux, une rémunération équitable, des conditions de vie correctes et une attention accrue accordée à la santé et à la sécurité. D'autre part, le système SNFM implique l'interaction avec les populations locales. Cette interaction peut avoir des impacts positifs considérables mais si la gestion n'est pas maîtrisée, les effets, peuvent être à l'inverse, négatifs aussi bien sur la population que sur l'entreprise. L'intégration des populations locales dans les activités du projet et le partage équitable des bénéfices constituent une composante clé du système SNFM. Les partenariats doivent reposer sur quatre

principaux facteurs de réussite : respect mutuel, confiance, faisabilité et communication.

Evaluation empirique

Caractéristiques générales des sociétés forestières interrogées

Des informations ont été recueillies auprès de 51 entreprises forestières (parmi 187 contactées) gérant des surfaces considérables de forêts naturelles tropicales et subtropicales, agissant toutes sous le régime de certification du FSC® ou du PEFC. Ces sociétés couvrent un grand nombre de caractéristiques. Près de la moitié est localisée en Amérique latine, la moitié restante est répartie entre l'Afrique (12) et l'Asie du sud-est (15). Elles gèrent différents types de forêts, les forêts pluviales étant les plus fréquentes. L'état initial des forêts gérées varie entre des forêts intactes à des forêts fortement endommagées. 70 % des sociétés possèdent des droits de concession sur les surfaces forestières, le reste en est propriétaire. Les droits d'usage sont attribués en moyenne pour une durée de 16 à 45 ans. La surface totale et la production nette sont très variables avec des valeurs inférieures à 1000 ha et dépassant dans certains cas les 1,5 millions ha.

Concepts et pratiques sylvicoles

L'ensemble des sociétés sondées applique un système polycyclique. L'utilisation à grande échelle du système d'exploitation à faible impact (RIL) est confirmée par les résultats du sondage: une grande partie des sociétés appliquent les meilleures pratiques concernant la planification, les interventions et le suivi en forêt. Cependant, moins de 20 % des entreprises utilisent encore des traitements sylvicoles visant une augmentation de la productivité, tels les coupes de dégagement ou l'élimination des arbres en décomposition. En outre, la coopération et les échanges avec d'autres sociétés et instituts de recherche constituent une pratique courante et une grande partie des entreprises consacrent un budget à la recherche et l'innovation.

La production de bois

La plupart des entreprises opèrent avec des périodes d'intervention de 20 à 30 ans. Le nombre d'espèces commerciales est faible et ne dépasse que rarement le nombre de 20, ce qui souligne le défi lancé concernant la commercialisation des espèces moins connues: trois quart des entreprises essayent de commercialiser ces espèces-là tandis que la moitié

d'entre elles affirment que cela reste une barrière. Comme pour la productivité forestière, les valeurs collectées varient considérablement selon l'entreprise. En général, 75 % des entreprises enregistrent des valeurs d'accroissement annuelles (MAI) inférieures à 5 m³ par ha et par an et des volumes d'abattage compris entre 20 et 30 m³ par ha et intervention (équivalant à environ 1 m³ par ha et par an). La variabilité des cycles d'intervention et des volumes d'abattage peut être partiellement expliquée par la diversité naturelle des conditions biophysiques mais également par un manque de précision des concepts et unités, ce qui rend difficile l'obtention de données comparables et fiables.

Performance économique et marchés

La déduction de références concernant les coûts de production et les recettes s'est révélée difficile soit par manque de données fiables soit par réticence des détenteurs à les partager. Cependant, quelques valeurs médianes ont pu être déduites :

- Coûts des opérations de récolte : 30 USD par m³
- Coûts de gestion sylvicole : 15 USD par ha et par an
- Coûts de transport : 20 USD par m³ et par 100 km
- Coûts d'administration : 28 USD par ha et par an
- Prix des rondins : 109 USD par m³

Les chaînes d'approvisionnement, le marché de bois provenant des forêts naturelles et la concurrence avec le bois de plantation sont autant de facteurs favorables montrant l'existence d'un marché bien défini et intéressant pour le bois provenant de forêts naturelles. Les obstacles sont, eux, liés aux prix du bois, à la distance des marchés et à la concurrence avec le bois d'origine illicite.

Aspects environnementaux

65 % des sociétés soumises aux sondages opèrent dans des écosystèmes à biodiversité élevée et 68 % intègrent la gestion de biodiversité dans leurs interventions. Cependant, les espaces de conservation et de restauration, représentant de 9 à 28 % de la totalité de la surface gérée, ne sont pas considérés comme un obstacle pour la performance économique. De même, les exigences liées au contrôle des impacts environnementaux ne constituent pas non plus de barrière et sont souvent établies en coopération avec les ONG. 90 % des entreprises sont approuvées par les organisations environnementales. Les impacts négatifs des forêts HCV ne sont pas fréquents mais les données sont souvent non disponibles. Les charges annuelles ayant pour objectif la protection de l'environnement sont comprises entre 120 et 520 USD par 1000 ha sur la totalité de la surface.

Aspects socio-économiques

L'emploi permanent généré par 1000 ha de surface à production nette varie entre 1 et 7 employés. La disponibilité d'une main-d'œuvre qualifiée reste un critère décisif pour les entreprises. La plupart d'entre elles accordent un budget à la formation et au renforcement des capacités (la moitié des entreprises investissent entre 10 et 100 USD par an et par employé permanent). La raison principale de l'exode des travailleurs est liée aux difficiles conditions de travail. Concernant la population locale, le nombre de personnes affectés reste très variable selon l'entreprise et inclut dans les deux tiers des cas la population indigène; les entreprises font des efforts considérables concernant le développement socio-économique (la moitié

d'entre elles investit de 50 à 800 USD par 1000 ha et par an). On constate que, malgré cela, l'impact réel de telles activités demeure discutable et la relation avec les communautés locales est encore considérée comme obstacle à la performance économique, surtout à cause des risques engendrés par la coupe illégale et l'empiétement sur la surface de production. D'un autre côté, les groupes communautaires et la coopération avec des organisations extérieures sont des facteurs de succès.

Défis

Coûts d'opportunité liés à la gestion durable des forêts naturelles

Les forêts soumises au SNFM ne sont économiquement compétitives face à une exploitation plus intensive des terres, comme la production agricole ou les plantations forestières, que dans des conditions très particulières où les coûts d'opportunité sont relativement bas, par exemple dans des zones isolées, des surfaces à faible potentiel agricole et des terres légalement classifiées pour l'exploitation forestière exclusivement. Les résultats des sondages confirment cela avec plus de 70 % des entreprises qui jugent que leurs terrains forestiers sont inaptes à l'agriculture ou que l'exploitation forestière reste le seul mode d'exploitation autorisé. Dans la plupart des autres cas, les forêts naturelles ne peuvent être préservées que par une volonté politique. Néanmoins, la gestion professionnelle des forêts naturelles et la mise en œuvre de concepts performants de restauration sont autant de critères décisifs pour la conservation des forêts naturelles comme un élément essentiel du paysage et pour la fourniture de matières premières pour un marché de produits forestiers grandissant.

Augmentation de la productivité

Améliorer la productivité forestière est un facteur clé pour assurer la gestion durable et renforcer la compétitivité de la gestion des forêts naturelles. Néanmoins, même si les mesures sylvicoles à impacts positifs prouvés sont disponibles, seule une petite partie des entreprises les applique. La raison essentielle réside dans le manque de mesures d'incitation comme des surfaces forestières trop grandes et des droits de concession dont la durée est en permanence inférieure à celle d'un cycle d'intervention, ce qui rend inutile l'investissement dans des récoltes consécutives. De plus, la législation forestière est souvent obsolète et non conforme à des pratiques durables, en l'occurrence, l'interdiction fréquente des coupes d'arbres à faible diamètre qui rend difficile la promotion des arbres d'avenir par éclaircies.

Le succès de la commercialisation des produits forestiers

Un contexte favorable au marché ainsi que des connaissances du marché sont essentiels au succès économique des forêts soumises au SNFM. Le principal défi réside ici dans les activités de coupes illégales qui représentent 50 à 90 % du volume de bois des principaux pays producteurs et 15 à 30 % de l'ensemble. Le programme FLEGT (acronyme anglais pour «Application des réglementations forestières, gouvernances et échanges commerciaux») et la loi Lacey peuvent y contribuer en limitant la présence de bois illégal sur les marchés d'export. Le second défi consiste en la commercialisation des espèces secondaires, ayant pour potentiel une augmentation

du rendement économique et une réduction de la dégradation forestière, ce qui requiert cependant du temps et des ressources pour la recherche. Une des alternatives réalisée avec succès par certaines entreprises consiste en l'intégration de la transformation du bois qui garantit l'approvisionnement en matières premières et la qualité tout en diversifiant la gamme de produits. Enfin, dernier point mais pas le moindre, certaines sociétés génèrent des revenus provenant de la prestation de services environnementaux. Cependant, les paiements des services environnementaux ne jouent globalement qu'un rôle secondaire.

Une gouvernance et une législation forestières pour créer des conditions cadre favorables

Le secteur forestier a été traditionnellement un secteur informel. Ceci a un impact très négatif sur le rendement économique des entreprises qui appliquent le système SNFM et constitue un frein pour les investisseurs internationaux, très sensibles aux risques de réputation. La gouvernance et la législation forestières définissent le cadre dans lequel opèrent les entreprises forestières. Des plans cohérents en matière d'aménagement du territoire, une garantie de droits d'usage à long terme tout comme une mise à jour de la législation et une simplification des procédures sont autant de facteurs essentiels à la promotion du système SNFM. Enfin, des initiatives internationales telles que REDD+ et FLEGT sont souvent perçues par les entreprises comme appartenant encore à un registre conceptuel et nécessitant d'être adaptées au contexte réel des entreprises afin de pouvoir générer des résultats tangibles.

Options d'investissement

Le secteur privé peut jouer un rôle très important dans le financement des systèmes SNFM et montre un intérêt croissant pour le secteur forestier. Cependant, à l'heure actuelle, ce type d'investissement reste minoritaire et est pour la plupart réalisé par des industries proches du secteur forestier, comme les entreprises forestières, les industries de transformation du bois et les industries consommatrices de bois. Afin de promouvoir les systèmes SNFM à une échelle significative, il faut contacter un grand nombre d'investisseurs commerciaux, pour lesquels des cas de réussite et des opportunités claires d'investissement doivent être définis et les risques de réputation atténués. Afin d'atteindre cet objectif, quatre principaux schémas d'investissements ont été identifiés devant être menés en parallèle:

1. Investissements dans l'amélioration des sociétés forestières afin de promouvoir leurs pratiques du SNFM. Elles devraient se concentrer sur l'augmentation des capacités techniques et de gestion, augmentant ainsi la productivité à travers une meilleure gestion sylvicole, faisant l'acquisition d'un équipement et d'une technologie modernes afin d'augmenter le rendement et de réduire les impacts. Compte tenu de la taille relativement réduite des investissements, moins d'un million d'USD, les investisseurs les plus adaptés sont les entreprises forestières et les investisseurs d'impact, pour lesquels des bénéfices sociaux et environnementaux clairs peuvent être obtenus.
2. Des investissements afin de renforcer le système SNFM à travers l'agrandissement des sociétés qui réussissent et la création de nouvelles sociétés. De tels investissements ont un potentiel d'impact élevé, requièrent des capitaux

considérables (un montant supérieur à 5 millions d'USD) et comportent des risques relativement élevés. Par conséquent, les investisseurs commerciaux avec des mandats adaptés à ce genre d'investissements, essentiellement des institutions de financement et de développement ainsi que des banques de développement, constituent ici le groupe d'investisseurs le plus approprié. À long terme, ce type d'engagement peut ouvrir la voie à d'autres investisseurs d'actifs, comme les fonds de retraite et les banques d'investissement en créant des programmes performants et en réduisant les risques associés.

3. Investissements dans la chaîne de valeur, en associant la production de matière première aux installations de transformation du bois, assurant ainsi une qualité continue et un approvisionnement en matières premières, peuvent améliorer le taux de rendement et offrir plus de flexibilité de réaction à la dynamique de marché. Les montants sont compris entre un et plusieurs millions d'USD et les taux de rentabilité interne sont habituellement supérieurs à 15 %. Ce type d'investissement est déjà réalisé par les entreprises forestières et les banques commerciales.
4. Investissements visant à créer des conditions cadre favorables, afin d'améliorer le cadre juridique dans lequel opèrent les entreprises forestières. La réalisation d'un cadre légal ainsi que l'application des lois sont des éléments essentiels pour améliorer la performance des systèmes SNFM et réduire les risques politiques associés encourus par les investisseurs internationaux. L'aide financière nécessaire afin d'améliorer la gouvernance forestière est restreinte aux investisseurs à but non-lucratif et aux investisseurs d'impact et nécessitera par conséquent d'être couverte par le secteur public ou par les ONG.

Conclusions finales

Le système SNFM est une solution performante pour un aménagement du territoire respectueux de la nature, un approvisionnement en matières premières répondant à un marché du bois en expansion, conservant la biodiversité et le stock de carbone. Il existe plusieurs exemples d'entreprises forestières dans le monde qui accomplissent un travail remarquable et appliquent les meilleures pratiques. Cependant, il existe aussi des obstacles qui freinent une meilleure performance des systèmes SNFM. Les défis principaux ici identifiés concernent : 1) l'amélioration du cadre encore informel du secteur forestier et la diminution des coupes illégales, 2) l'augmentation de la productivité à travers des pratiques sylvicoles appropriées et 3) la promotion d'un portefeuille de produits commercialisables des entreprises forestières par la commercialisation d'espèces moins connues et/ou l'intégration à la chaîne de valeur.

Dans la perspective de créer des paysages à la fois divers et fertiles, produisant du bois pour une population mondiale croissante, les systèmes SNFM prendront de plus en plus d'importance à l'avenir. Néanmoins, la part de zones forestières naturelles gérées de manière durable reste très faible. Afin d'augmenter considérablement la surface soumise au SNFM et de relever les défis mentionnés ci-dessus, des investissements du secteur privé et public sont requis. À l'heure actuelle, l'engagement des investisseurs (commerciaux) dans la gestion des forêts naturelles demeure faible mais l'intérêt qu'on y porte est croissant. Afin de mener ces projets à bien, il est nécessaire que les investissements privés et publics, à différents niveaux, aillent de pair.

1 BACKGROUND

Natural tropical forests cover more than 1.6 billion hectares (ha) in 65 countries, more than half (887 million ha) of which are primary forests (Blaser and Thompson 2010). Although deforestation rates have been reduced in some of these countries, rates in the tropics remain at high levels and do not even include the vast forest areas that are degraded. Deforestation is mainly due to conversion for agricultural land uses, while forest degradation is caused mostly by unsustainable logging practices, both legal and illegal. The area subject to unsustainable forest exploitation is estimated to range between 0.85 and 1.1 billion ha. Since the pressures on natural forests in developing countries are likely to persist in the near future, many forest ecosystems are threatened by conversion or degradation, which impairs the many services and benefits they provide. Even though a significant proportion of current natural forests will be converted into other land uses in the future, it can be assumed that the most important part (we estimate around 1 billion ha) will remain as natural forests in different stages of degradation. Given this enormous area, achieving the sustainable management of natural forests is of utmost importance.

Sustainable natural forest management (SNFM) is a close-to-nature land use, representing a balance between full protection and more intensive land uses, such as agriculture and plantation forestry. It can generate stable sources of revenue with attractive cash flow profiles¹ for investors, while having positive environmental and social impacts through the preservation of ecosystem services, the generation of employment and the diversification of the productive landscape. Yet it faces a range of political, institutional and technical challenges and barriers that limit its actual implementation. Blaser et al. (2011) estimated that in 2010 only 31 million ha were managed under sustainable timber production schemes and that even less (17 million ha) were managed by certified forest companies. Despite this, we argue that with the implementation of improved forest management practices it is possible

to enhance the current value of forests and hence to reduce opportunity costs with respect to other land uses related to deforestation and forest degradation. Moreover, it should be possible to attract private sector actors seeking positive environmental and social impacts from their investments.

This study aimed to investigate best practices in SNFM implemented by large-scale forest companies in the tropics and subtropics, mainly for the commercial production of timber. To achieve this, we combined a comprehensive literature review with an empirical assessment of forest companies. In a first phase, we identified in the literature the major and most widely accepted best practices of SNFM. The results are presented in section 2. In a second phase, in order to understand the level of implementation of identified best practices on the ground, we conducted an online survey of large-scale forest companies operating in the tropics and subtropics. Participants were selected from among the Forest Stewardship Council® (FSC®) and the Programme for the Endorsement of Forest Certification (PEFC) certified forest companies, assuming that they meet widely accepted sustainability standards. The information collected from a total 51 companies provides insight into practices implemented, production and economic benchmarks, social and environmental performance, and success factors and barriers faced by these companies. The information gained through the online survey was complemented by more comprehensive case studies of six certified forest companies in America (Bolivia and Paraguay), Africa (Cameroon and Republic of the Congo) and Asia (Indonesia and Vietnam). The most relevant results are presented in section 3. On the basis of the results derived from primary and secondary sources, we address in section 4 the key perspectives and challenges of SNFM and their interdependencies. This analysis forms the basis to identify investment opportunities for the public and the private sector to enhance and promote SNFM in the tropics and subtropics (section 5).

¹ Unlike reforestation projects, SNFM allows positive cash flows a few years after having launched the business.



2 LITERATURE REVIEW

Introduction

Blaser and Thompson (2010) define sustainable forest management as “the process of managing forests to achieve clearly specified objectives of management, with regard to the production of a continuous flow of desired forest products and services, without undue reduction in the forest’s inherent values and future productivity, and without undue undesirable effects on the physical and social environment”.

The main objective of large-scale SNFM companies is generally the production of timber for the generation of sustainable economic returns. To achieve this, companies need to set up overall professional management, including determination of suitable silvicultural approaches, appropriate planning and implementation of forest operations, and efficient monitoring of costs, growth and yields. Additionally, the management of the forest should not cause undue damage to the environment. On the one hand, this includes the natural environment and implies that the management should also contribute to the maintenance and enhancement of ecosystem services provided by the forests, such as high biodiversity and carbon stocks, and the protection of soils and water resources. On the other hand, it also includes the social environment, meaning that the management should respect the cultural values and traditional uses of the forest by the local population, as well as have a positive impact on the socio-economic environment through the creation of employment and dynamization of local economies. All aforementioned aspects are closely related to each other and require a holistic planning and implementation approach.

The proper implementation of SNFM requires a high level of professionalism and needs to be based on proven best practices. Applied research on SNFM in the tropics has a long history, starting in the early 20th century and peaking in the 1980s and 1990s when deforestation in the tropics reached a peak and received more and more attention from the international community. In this section we provide an overview of broadly accepted research results on, and best practices of, tropical natural forest management. The section includes first an overview of silvicultural management approaches, followed by best practices for planning and forest operations, and key figures on timber production, economics and markets. Finally, it provides relevant guidance related to the environmental and socio-economic dimensions of SNFM and addresses the role of certification.

Silvicultural management approaches

Sustainable silvicultural management aims at enhancing the productivity and/or quality of the forest in order to optimize the economic outputs of forest operations without harming sustainability. Related silvicultural interventions comprise the following aspects:

- Assurance of forest regeneration, either through enhancement of natural regeneration or through enrichment planting.
- Regulation of competition to concentrate the site-given growth potential on the so-called potential or future crop trees (PCT or FCT). These interventions encompass tending of renewals, liberation thinning to eliminate competitors of PCTs and, where necessary, liana cutting.
- Careful harvesting of mature commercial timber species through the application of reduced-impact logging techniques.
- Gradual reduction of mature and over-mature tree relicts with no or limited commercial value due to their species or individual properties.

Figure 1 presents an overview of main silvicultural management approaches in the tropics. The fundamental difference between these concepts is whether the silvicultural strategy leads to polycyclic or monocyclic forest management.

On the one hand, polycyclic approaches aim to domesticate tree species composition while maintaining the original multi-layer, multi-age structure of natural forests. This is the most common approach for natural forest management in the tropics. Most frequently, a minimum harvest diameter is established to determine mature trees (minimum harvest diameter or MHD system). Values are set by national authorities, with diameter at breast height (DBH) ranging from 30 to 70 cm or more. This system is a pragmatic approach to controlling overexploitation of natural forests but it does not directly target the improvement of forest growth and quality. The silvicultural approach with the highest impact on the productivity and quality of the forest is PCT or FCT management. In this case, 150 to 300 high quality trees per ha are selected in all diameter classes and the site-given growth potential is concentrated on this tree collective. By applying this type of management, growth and yield can be enhanced by 50 % or in some cases even more (see Table 1).

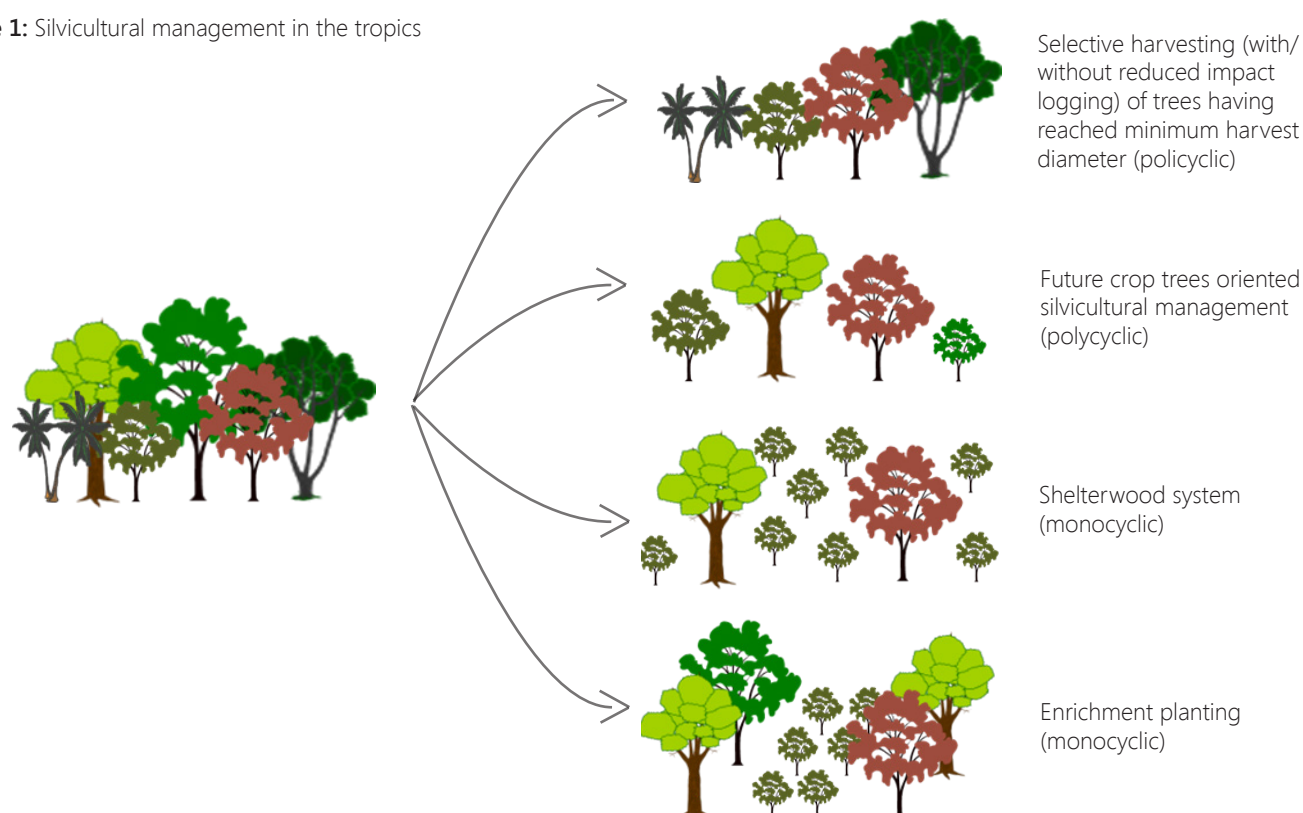
Country	Enhancement of increment (%)	Observation period (years)	Source
Indonesia, Philippines	30-100 %	2-5 years	Weidelt (1986)
Cote d'Ivoire	60-100 %	4 years	Maitre (1987)
Philippines	10-50 %	4-5 years	Wöll (1989)
Paraguay	60-80 %	10 years	Grulke et al. (2009)

Table 1: Growth and yield enhancement through liberation thinning

On the other hand, monocyclic approaches are less frequent in natural forest management in the tropics. Such approaches aim to domesticate tree species composition and additionally to reach a homogenous age structure of the forests. This results when forest regeneration is introduced using shelter-

wood systems² or where big areas are managed using enrichment planting. The latter may gain importance in the future, as intensive enrichment planting in broad strips of 15 to 20 meters is a valid option for restoring highly degraded natural forests.

Figure 1: Silvicultural management in the tropics



² In shelterwood systems, some mature trees are left and the new tree generation is introduced through natural regeneration, sowing or planting in the shade of the shelterwood trees. After some years, the shelterwood trees are removed completely.

Management planning

There is a broad consensus that planning should be conducted on two levels (see Figure 2):

1. A long-term management plan, based on the objectives of the company and on the state of the forest resources. The timeframe of management plans ranges between 10 and 30 years and includes revisions every 5 to 10 years. Consistent and comprehensive management plans have to be based on reliable inventory data regarding the state of the forest. The key aspects covered by a management plan include:
 - Determination and description of the silvicultural approach applied in order to reach the management objectives with the available forest resources.
 - Forest function mapping (production and protection forests), definition of annual management units and forest road design.
 - Definition of techniques, operations and procedures.
 - Prediction of results and impacts. The most important aspect is the definition of production output (annual sustainable harvested volume) and economic patterns (costs and revenues). However, with the increasing certification initiatives of the 1990s, environmental and social impact prediction and monitoring have gained substantially in importance.
 2. An annual operational plan to implement forest management activities. On this level all operations are planned in detail, including pre-harvest inventories, logging operations, silvicultural treatments and secondary road networks. Good annual plans also include a training plan for the staff.
- In this context, the concept of adaptive management has been widely accepted as a key success factor, given the inherent spatial and natural complexities of natural forests. Adaptive management can be understood as a continuous learning process. It involves the use of science (i.e. research results) to

support best practices, planning and monitoring to compare results against expected outcomes, and adapting practices accordingly to improve outcomes based on the original expectations (Blaser and Thompson 2010).

Reduced Impact Logging

Since the late 1980s, reduced impact logging (RIL) has prevailed as the most important and visible best practice tool to support the implementation of SNFM, and has become an obligatory component of forest certification.

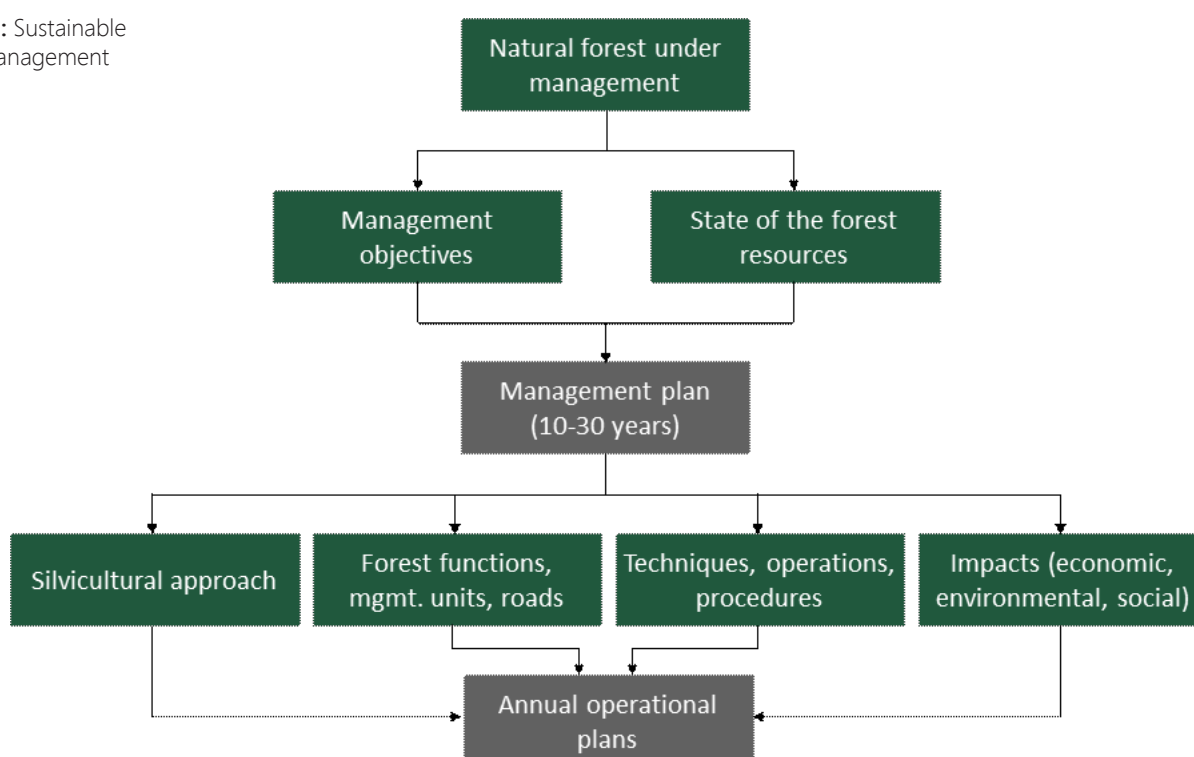
RIL can be defined as intensively planned and carefully controlled selective timber harvesting conducted by well trained workers in ways that minimize the deleterious impacts of logging. It consists of a series of activities aimed at protecting PCTs and advanced regeneration from injury, minimizing soil damage, preventing damage to non-target species and protecting critical ecosystem processes (Putz et al. 2000, as cited in Ros-Tonen et al. 2008).

The key steps of RIL include:

- A detailed pre-harvest plan, including planning and construction of road networks, drainage and water crossings.
- The implementation of harvesting operations by applying low impact harvesting techniques (mainly directional felling and skidding by using cable winches). The advantages of such techniques have been confirmed by many research results (Grulke 1998, Pereira et al. 2002, FAO 2004, Valle et al. 2007) and forest management companies (Fratini 2006), stating that damage to the remaining forest is reduced by 50 to 80 %.
- Undertaking post-harvesting interventions, and monitoring and evaluation of forest operations.

Over the past 15 years, various practical RIL guidelines have been published, which provide detailed step-by-step guidance on RIL implementation (e.g. FAO 2003, 1999, 1996).

Figure 2: Sustainable forest management planning



Forest productivity and timber production

For most natural forest management companies, timber constitutes the key revenue stream. Non-timber forest products (NTFPs) and emerging payments for ecosystem services (PES, such as water, biodiversity and carbon) still play a limited role and have so far not influenced investment decisions.

The production potential of natural forests depends on multiple factors:

- Biophysical conditions, including climate, soil, topography and forest type.
- Forest product markets, related to types of products demanded and tree species accepted.
- Silvicultural factors, mainly the application of silvicultural treatments to enhance growth of commercial trees.

The mean annual increment (MAI) fluctuates considerably among regions. Values for total MAI start at 1–2 m³ per ha per year in very dry forests, like Chaco or dry Miombo, and can reach up to 15 m³ per ha per year in well-managed tropical rainforests on good soils. However, the total MAI, which includes all tree species, is of limited explanatory power with regards to economic performance and sustainability of logging activities. Although tropical forests are rich in plant diversity and usually have more than 100 different tree species, only a small proportion is commercially relevant³. Forest companies normally sell between 10 and 20 (up to 30 in best cases) different tree species, and in most cases only 1–5 tree species are responsible for the major turnover of the company. Thus, the decisive component of the MAI is its share of commercial volume, i.e. good quality logs of commercial tree species.

In the same way, logging intensity varies significantly among forests. It ranges between 1 and 15 (even 20) trees per ha and intervention, which is equal to approximately 5 to 50 m³ of extracted commercial log volume. If we assume intervention cycles (i.e. time span between two interventions) of 20 to 40 years⁴ such yields are equivalent to 0.5 to 2.5 m³ of commercial log volume per ha per year. Hence, the actual yields are significantly lower than total MAI values.

As for the impact of logging activities on productivity over time, a meta-analysis by Putz et al. (2012) based on more than 100 publications on selective logging revealed that timber yields decline by about 46 % after the first harvest but are subsequently sustained at that level. In contrast, if only the same species continue to be harvested, only 35 % of the original timber stock will be available for the second cut and yields will likely decline thereafter if no silvicultural treatments are applied. Applying RIL is likely to reduce these productivity losses and major benefits accrue mainly after the second harvesting intervention, where significantly higher yields were reported. This calls for the application of better silvicultural management and for continuous research and development of markets, in particular for so-called secondary species that are currently less known in order to maintain the revenue basis.

Economic performance

General statements concerning economic performance of SNFM are difficult to make. This is due, on the one hand, to the scarcity of reliable data. On the other hand, species composition and growth dynamics vary greatly between different tropical regions, and even within the same region large differences exist. For example, in the Brazilian Amazon sustainable harvest volumes per ha and intervention vary between < 15 m³ in Terra Firme Forests near Manaus and almost 40 m³ in the Paragominas area (De Graaf et al. 2003).

A financial analysis carried out by Frattini (2006) analyzed factors influencing the profitability of three SNFM companies in Amazon State in Brazil. Buildings and maintenance of infrastructure and purchase of forest estates were the most important factors influencing profitability of forest management. When timber processing activities, which all three companies included, were also considered in the analysis, the most important factors were the percentage of harvested roundwood that could actually be processed and the prices fetched for products.

Frattini calculated an overall internal rate of return (IRR) of 6.5 % for these three companies. These values differ significantly from those obtained by Gardingen et al. (2003) for dipterocarp forests in South East Asia. These forests can sustain yields of 50 to 60 m³ per ha and intervention and allow for an IRR of as much as 16 % assuming an ideal management. IRRs above 10 % are also reported from SNFM in Paraguay (Grulke et al. 2014).

Global tropical timber markets

Tropical hardwood accounts for 12 % of global roundwood production (Saviva 2013). Unlike timber from plantations, tropical hardwood is not traded as an international price-based commodity. Marketing and trade streams are mostly regional and depend on commercial agreements between single market actors (Held and Ossig 2013).

The three main production regions at the global level are the Amazon region, the Congo basin and South East Asia⁵. There is a general trend towards a decrease in timber production from natural forests, and some major producing countries have considerably lowered their production in the past years. Prominent examples are Indonesia and Malaysia who decreased the volume of harvested logs by 15 and 29 % respectively, between the years 2008 and 2012 (ITTO 2013). This decrease can be attributed to decades of unsustainable logging and an increase in legislation inhibiting such activities.

As for major processing and consumption countries, they are also situated in three main regions: North America, Europe and Asia⁶. Since the global economic crisis in 2007, demand has dropped considerably in North America and Europe. This decline, however, has been more than compensated by the steady growth Asia has seen over the past decade, where to-

³ Tree species are usually classified into three categories: (1) primary commercial species with high market demand and high prices, (2) secondary / promotional species with lower market demand or a lack of knowledge about timber properties and utilization potential and consequently lower prices, and (3) non-commercial species.

⁴ Higher frequency (e.g. 10 years) or particularly long cycles (e.g. > 50 years) are not common.

⁵ The Amazon region includes Brazil, Colombia, Venezuela, Bolivia, Peru, Ecuador, Suriname and Guyana. The Congo basin includes Central African Republic, Democratic Republic Congo, Republic of the Congo, Cameroon, Gabon, Equatorial Guinea, Rwanda and Burundi. South East Asia includes Indonesia, Cambodia, Lao PDR, Myanmar, Philippines, Thailand, Malaysia, Papua New Guinea and Brunei.

⁶ North America includes USA and Canada, Europe refers to EU 27 and Asia refers to China, India, and Vietnam.

tal tropical hardwood consumption almost doubled between 2000 and 2012 (Saviva 2013).

The present trend indicates that global demand for tropical hardwood from natural forests is growing whereas global production is decreasing. Prices for tropical sawn timber have seen a steady increase over the past 15 years (Saviva 2013). Also, the importance of timber and wood product certification labels in the market is very likely to increase in the future, even though it does not lead to premium prices. In Asia, certification or other proof of legal timber sources is currently not a purchase prerequisite for major importers, but the origin of tropical hardwood and connected reputational risks are subject to debates in the region (ITTO 2014). Concerning the two other main consumer regions, a recovering demand will require tropical hardwood sources able to cope with high demands on legality set by FLEGT and the Lacey Act.

Environmental protection and biodiversity

SNFM in general and RIL in particular are widely cited as the best option for conserving tropical forests, not only from an economic perspective but also in order to maintain ecosystem resilience, productivity and health, and to conserve biodiversity (Thompson et al. 2009, as cited in ITTO and IUCN 2009). A study by Putz et al. (2012) analyzing more than 100 publications on selective logging revealed that on average 76 % of carbon is retained in once-logged forests and that 85 to 100 % of species of mammals, birds, invertebrates and plants remain in the forest. Furthermore, SNFM includes the delineation and management of protected areas within the entire area under management.

In the context of its biodiversity conservation strategy, the FSC® adopted the high conservation value (HCV) concept as part of its principles and criteria in the late 1990s. HCV includes environmental and social values that are considered to be of outstanding significance or critical importance, and covers measures to ensure that these values are maintained or enhanced. The HCV concept is accepted by many forest companies but there are difficulties regarding its implementation. Although the HCV resource network⁷ provides detailed guidance on the application of this concept for practitioners, the assessment results of specific areas against the criteria can differ widely from auditor to auditor because the qualitative rather than quantitative nature of many indicators used (HCV 2013) leaves room for subjective interpretation.

Employment generation

The personnel of large-scale forest companies include persons with a range of skill levels and responsibilities. At an operational level SNFM requires a high level of technical expertise. FAO (1996) identifies three key characteristics of effective work units: “they are well organized, the workers are healthy and motivated, and everyone in the organization knows his or her job and how to do it efficiently and safely”. The simplest and least expensive way to develop skills is through on-the-job training by company supervisors and managers (FAO 2003).

A widely accepted code of conduct for company staff can be summarized as follows:

- Preference should be given to regular, annual and steady employment. Benchmarks on employment generation are not available in the literature.
- Employers should only assign workers to jobs that correspond with their age, physical capacity, state of health and vocational qualifications.
- All harvesting jobs and operations should comply with international standards and national labor codes.
- Given the element of risk in forest harvesting activities, special attention should be paid to health and safety⁸.
- In situations of equal qualification and experience, priority should be given to national personnel and to workers from nearby villages.
- Remuneration should not be based solely on productivity but financial incentives (e.g. bonus system) should be introduced to encourage workers to observe safety regulations, to reduce negative impacts and to maximize timber recovery.

Additionally, since forests are generally located in rural and remote areas, housing and access to basic human needs and services often represent a challenge. SNFM requires that workers' camps and accommodation, and any other administrative, technical, commercial and social facilities, are in place and meet minimum standards (FAO 2003).

Integration of communities and indigenous peoples

The management of natural forests implies the interaction between forest companies and local populations. This interaction can bring significant positive impacts, but if not managed properly it can harm populations and their livelihoods, as well as the company. Therefore, the integration of the local population into project activities and equitable benefit sharing is a key component of SNFM.

Partnerships with local populations may have various forms, which should take into account the characteristics and interests of the local population and the objectives of the company. Partnerships should build upon existing local organizations that ensure equitable representation, and seek empowerment of communities, through adequate revenue sharing agreements, and clear ownership of land (World Bank 2008). Conflict resolution mechanisms should also be in place. A review of 29 case studies (World Bank 2009) identified four major success factors in community-company partnerships: mutual respect, trust, practicality and communication.

Certification

Increasingly, the credibility of claims regarding SNFM are tested and validated through certification by qualified, independent organizations. Forest certification is a voluntary tool that sets principles and criteria for SNFM and determines verification schemes to ensure compliance with socio-economic, environmental and economic requirements of forest users. A product that meets certain environmental and socio-economic

⁷ <http://www.hcvnetwork.org/>

⁸ In 1998, the International Labor Organization issued the “Safety and Health in Forestry Work code”, which can be considered as best practice. Available at: http://www.ilo.org/safework/info/standards-and-instruments/codes/WCMS_107793/lang--en/index.htm



mic standards of such a certification scheme throughout the entire chain of custody carries a sustainability label. This label aims to fill informational gaps for investors and consumers who can thereby easily recognize a sustainably produced forest product. Certification might improve market access for forest products, achieve a price premium and reduce reputational risks of forest owners and producers.

Several certification standards are in use, the largest of which are the FSC⁹ and PEFC⁹, with more than 169 and 245

million ha of global forests certified in 2012, respectively. Although forest certification schemes are most developed in temperate and boreal forests, the pace of certification in the tropics is accelerating, both through increasing forest certified areas and through the development of regional certification initiatives, such as the Pan African Certification Scheme and the Malaysian Timber Certification Council.

⁹ Both certification standards, FSC[®] and PEFC, have very similar criteria and indicators. The difference is more at auditing level and in terms of stakeholder integration. Climate for Ideas et al. (2011) considers FSC[®] to be the more comprehensive and stronger standard.

3 EMPIRICAL ASSESSMENT

Introduction

In the previous section we presented an overview of broadly accepted best practices for tropical SNFM based on a literature review. In order to assess the level of implementation on the ground, we conducted an online survey of forest companies. Forest companies were selected from among FSC® and PEFC certified forest companies in the tropics and subtropics, and information on practices implemented, production and economic benchmarks, social and environmental performance, and success factors and barriers was collected. A total of 187 companies were contacted and a response was obtained from 51 companies (27 % response rate). To complement this information, we visited six selected companies in Bolivia, Paraguay, Cameroon, Republic of the Congo, Indonesia and Vietnam. The most relevant information collected is presented in this section. Thereafter, based on key results and comparisons,

we include a more critical analysis and interpretation of obtained data in section 4.

General characteristics of surveyed forest companies

The 51 forest companies that responded to the survey (out of a total 187 contacted) are located in 22 countries in the tropics and subtropics. Half of these companies (24) are located in Latin America and the other half is distributed among Asia (15) and Africa (12). The total area managed as reported by the companies amounts to over 12.3 million ha and includes a net production area of 7.3 million ha. Figure 3 shows the location of analyzed companies.

All surveyed forest companies manage large areas of natural forests and operate under FSC® or PEFC certification.

Figure 3: Worldwide distribution of the analyzed companies (43 observations)

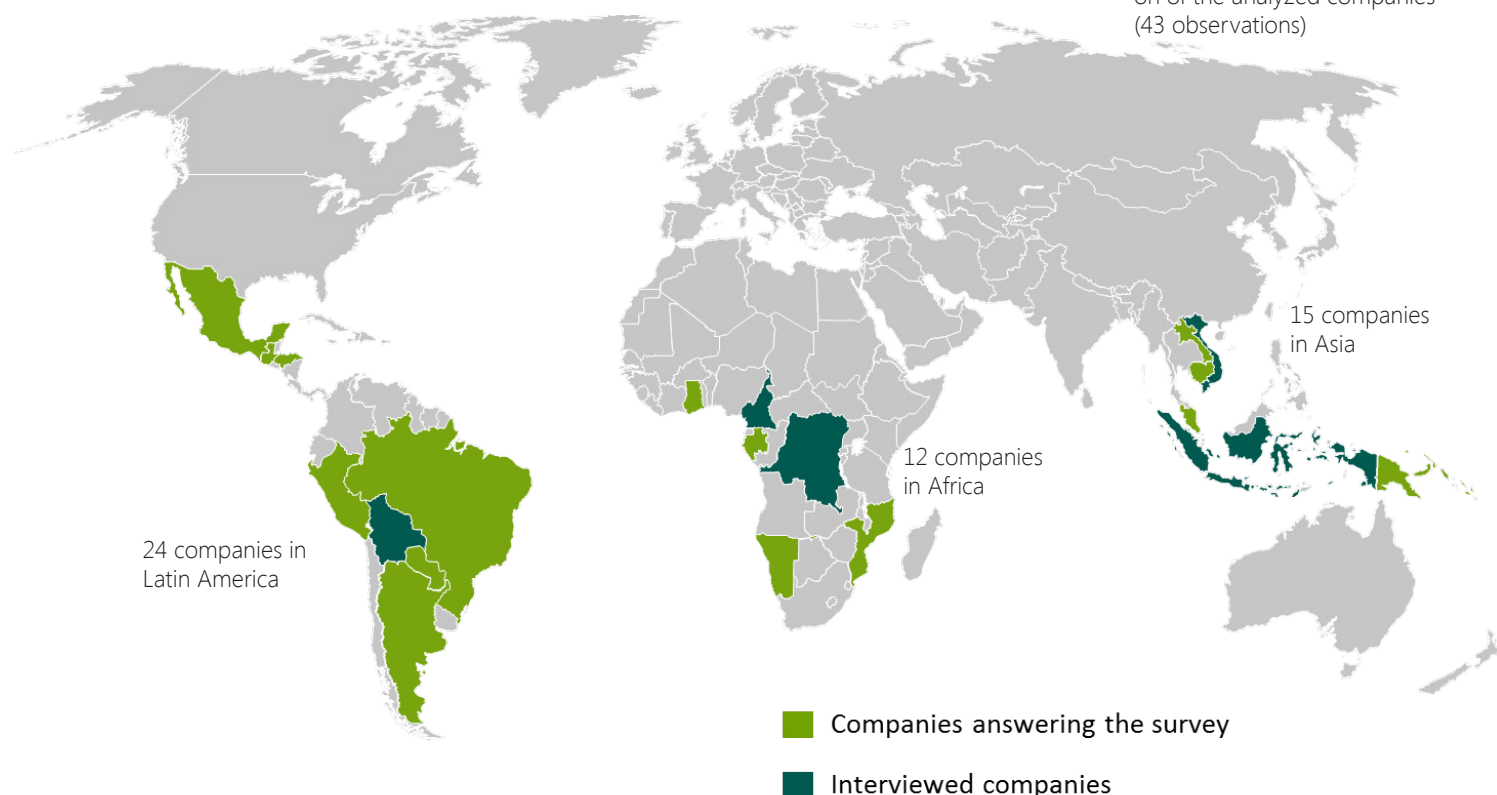
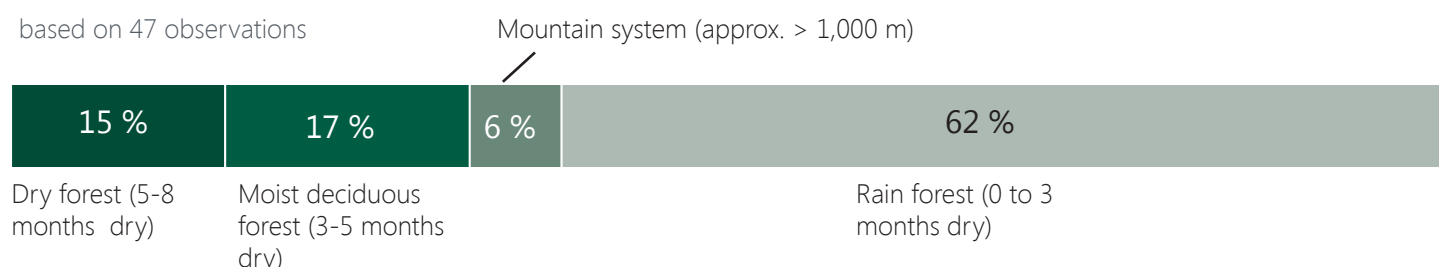


Figure 4: Main characteristics of forest companies

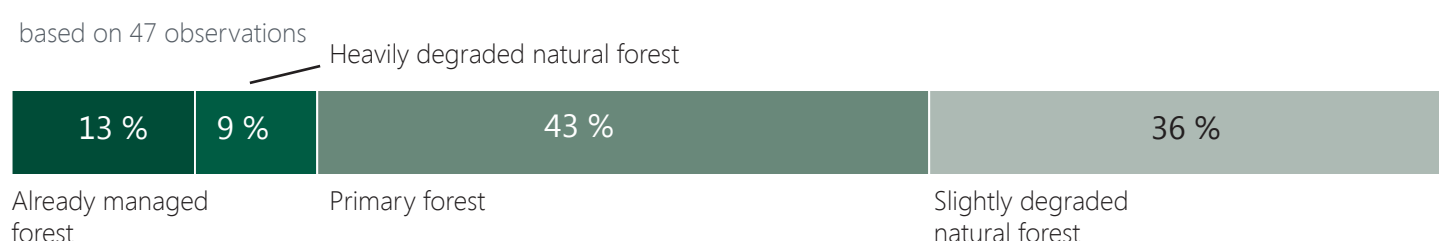
Types of forest

based on 47 observations



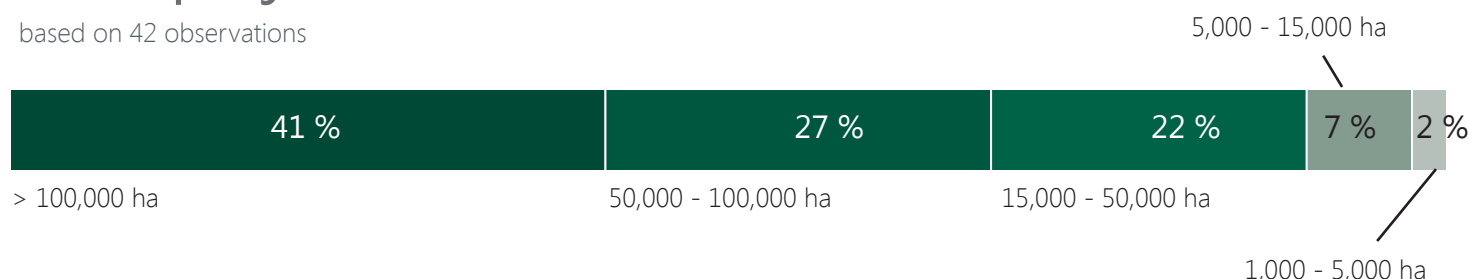
Baseline conditions

based on 47 observations



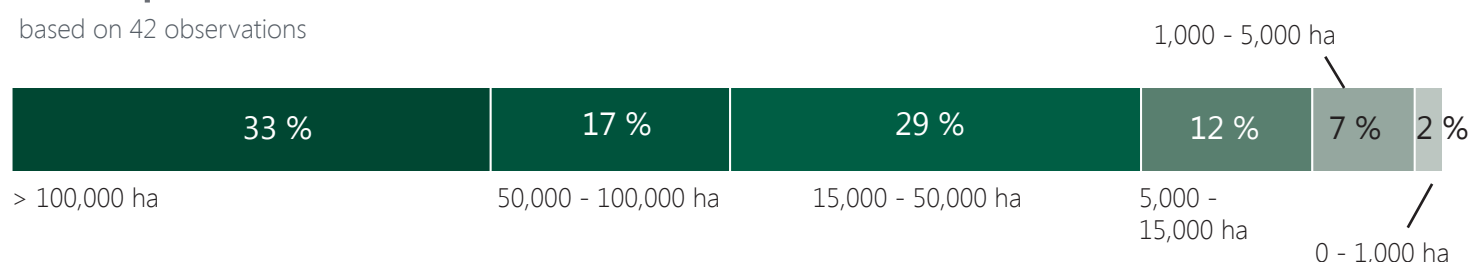
Total project area

based on 42 observations



Net production area

based on 42 observations



Despite this, surveyed companies cover a wide range of characteristics in terms of forest types, size of managed areas and land tenure rights. Their main characteristics can be summarized as follows:

- Companies manage different types of forests, rainforest being the most frequent; the initial state of the forests managed varies from untouched to heavily degraded (see Figure 4).
- Total area and net production area are very variable, with values reaching up to over 1.5 million ha in some cases (see Figure 4).
- 70% of companies have concession rights over the forest area, whereas the rest of them own the forests. The period

for user rights varies from 5 to unlimited years, with 50 % of companies having user rights for 16 to 45 years. There is an equal distribution of forest areas under concessions and those under ownership. The relationship between area and land tenure is highly dependent on the location: concessions have much larger areas than owned forests in Africa, whereas the situation is the opposite in Asia and Latin America.

- 87% of the surveyed companies are located in areas where land use changes are not allowed according to legislation, and 70 % stated that forestry is the only potential use in light of site conditions.

Silvicultural system and management practice

As was to be expected based on the literature review, all surveyed companies apply polycyclic systems based on selective logging. Figure 5 shows the application of different silvicultural systems.

Best practices in forest operations concerning roads, pre-harvesting inventories, harvesting operations and post-harvest assessment are commonly implemented by more than 75 % of the companies. This was confirmed during on-site visits, where it was observed that the implementation of RIL and high level techniques is quite frequent. In particular, the implementation of planning and monitoring is outstanding in some companies, where very sophisticated and detailed systems are used. This explains the fact that technical aspects are assessed as success factors by over 50 % of the companies.

On the other hand, the situation is very different for silvicultural measures which aim at enhancing the productivity of forests. As demonstrated in Figure 5, half of the surveyed companies do not apply any silvicultural treatments. Furthermore, the survey showed that less than 20 % of companies conduct liberation thinning or elimination of decaying trees, and that the focus on PCTs is much lower than on harvestable trees. However, the positive impact of such treatments on productivity has been proven by research, as indicated in the literature review, and was also confirmed during field visits to a few companies that have managed to increase increment values by 40 to 80 %. This raises the question as to what prevents most companies from applying such treatments (this issue is further analyzed in the next section).

Finally, half of the companies reported intervention periods of 23 to 30 years. These long periods may conflict with the periods for which companies have forest user rights, as is the case in concessions in Latin America, where user rights rarely exceed 15 years.

A common practice reported by most companies is cooperation and exchange. Over 80 % of all companies are associated in timber or forestry organizations, cooperate with universities and research institutions, have regular knowledge exchange with other companies, and test innovative techniques. Annual investments in innovation are in the range of 90 to 1,200 USD per 1,000 ha of net production forest (the range includes 50 % of the companies).

Forest productivity and timber production

The information provided by companies on forest productivity and timber production covers a wide range of values (see Figure 7). Lower values tend to be more frequent though, with 75 % of companies reporting MAIs below 5 m³ per ha per year and harvested volumes below 26 m³ per ha and intervention. This confirms the high variability in forest productivity, which is very dependent on several factors, mainly relating to biophysical conditions. Nevertheless, the high variability may also be related to a lack of clarity of concepts and units, as well as rather broad definitions of numeric values. In fact, several unrealistic values were identified during the analysis. Furthermore, during the on-site visits it was observed that little information on forest dynamics exists and that values are often just based on estimates for very large areas. Thus the data should be used cautiously.

It is noteworthy that the number of commercial species rarely exceeds 20. As discussed in the literature review, this number is low when compared to the total number of species in tropical forests, which often exceeds 100, and highlights the challenge related to less known species. As it turned out, three quarters of the surveyed companies try to commercialize lesser known species and half assess this commercialization as a barrier. This issue was discussed intensively during the on-site visits, where companies expressed their concern about being highly dependent on one major species or about the increase in the proportion of non-commercial species due to selective logging. To address this issue, some companies have engaged

Figure 5: Silvicultural system applied (40 observations)

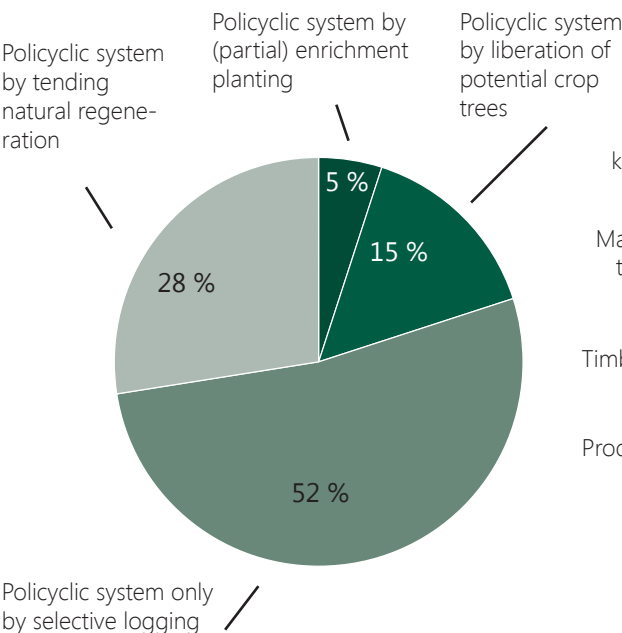
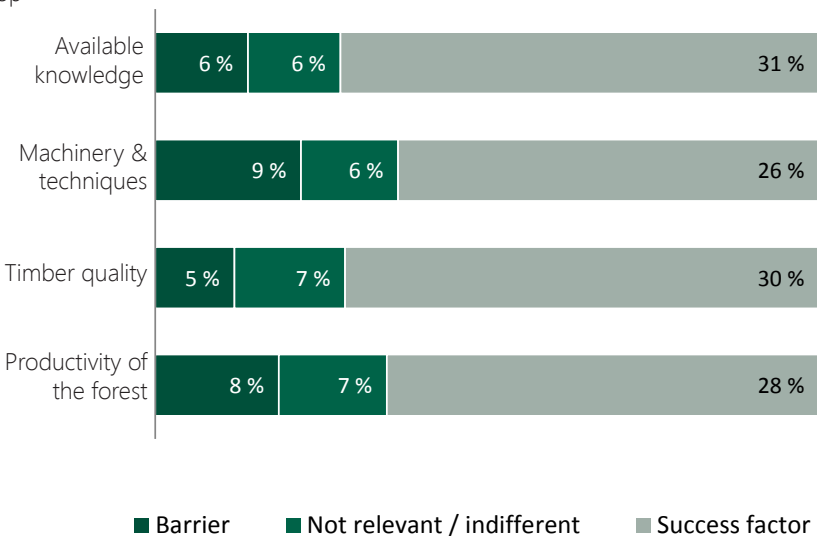


Figure 6: Analysis of technical aspects (42 observations)



in research on technical properties of non-commercial species. This topic is further analyzed in the next section.

Economics and markets

The survey confirmed that logs are the main product of companies. Furthermore, 63 % of surveyed companies include timber processing among their activities, and some of them also produce fuelwood and biomass. Although almost half of the surveyed companies also produce products which are not timber-related, the type and relevance of these products with regard to the total income was not assessed. Nevertheless, NTFPs are assumed to account for below 5 % of the total income. An exception to this is the case of Vietnam, where a PES system is in place and related payments account for 16 % of the total company income.

As for markets, almost all companies sell a proportion of their products on the domestic markets and three quarters export a proportion of their products, with total sold volumes distributed equally among both markets. To facilitate this, commercial agreements and cooperation within associations seem to be common practice amongst half of the companies, and long-term customer relationships were highlighted by visited companies as a key best practice.

Deriving benchmarks for production costs and revenues proved difficult. This is partly due to the fact that companies are often reluctant to provide economic data, but also to the fact that in many cases such data are simply unavailable. There is also a general lack of clear definitions, which makes it difficult to obtain comparable values. In the following, some benchmarks for production costs and timber prices are provided (median and range including 50 % of surveyed companies), based on 15 to 22 observations:

- Harvesting operations costs: 30 USD/m³ (13-69)
- Silvicultural management costs: 15 USD/ha (1-75)
- Transport costs: 20 USD/m³/100 km (14-30)
- Administration costs: 28 USD/ha (8-94)
- Log prices: 109 USD/m³ (53-167)

These figures generally coincide with data reported from other case studies in the literature. For instance, Frattini (2006) found average harvesting costs of 22 USD/m³ (ranging from 15 to 32 USD/m³) and De Graaf et al. (2003) reported 19 USD/ha as silvicultural management costs. As for log prices, the same author reported 220 USD/m³ for premium logs (mahogany), 80 USD/m³ for medium-priced species and 40 USD/m³ on average for other species. With respect to natural forest log prices on domestic markets, the ITTO (2013) reports:

- Brazil (Guariuba, Jataba, Ipe) between 85 and 155 USD/m³,
- Ghana (Wawa, Khaya, Sapele, Makore) between 90 and 185 USD/m³, and
- Indonesia (Meranti) between 220 and 290 USD/m³.

Top prices are paid for Spanish cedar (300 USD/m³), mahogany (900 USD/m³) and natural forest teak (750-2,000 USD/m³).

The analysis of success factors and barriers related to market and economics mostly identifies barriers. However, three particular aspects are not assessed negatively by companies: supply chains, markets for natural timber and competition with plantation timber. This shows the existence of a

Figure 7: Productivity and production values

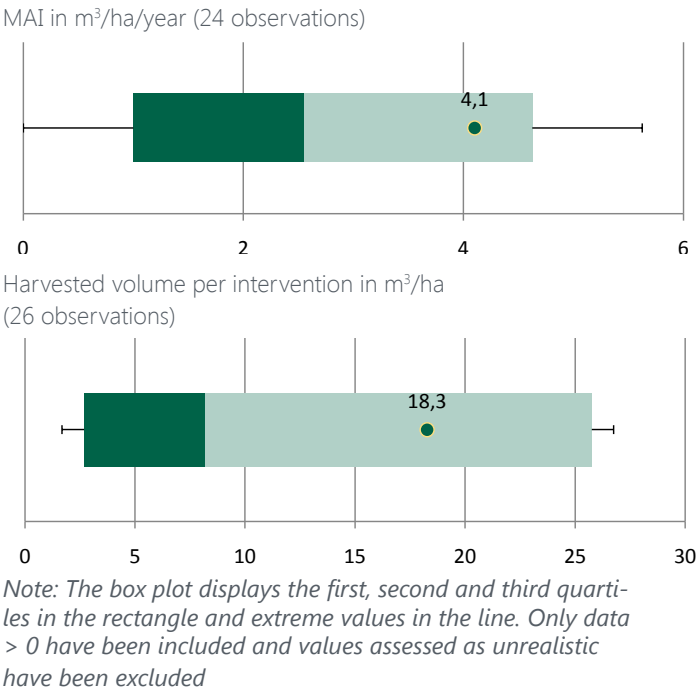


Figure 8: Sold volumes per company (41 observations)

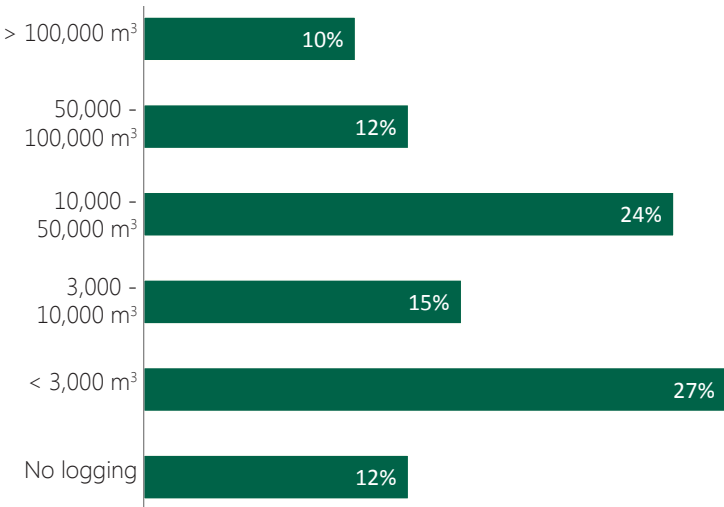
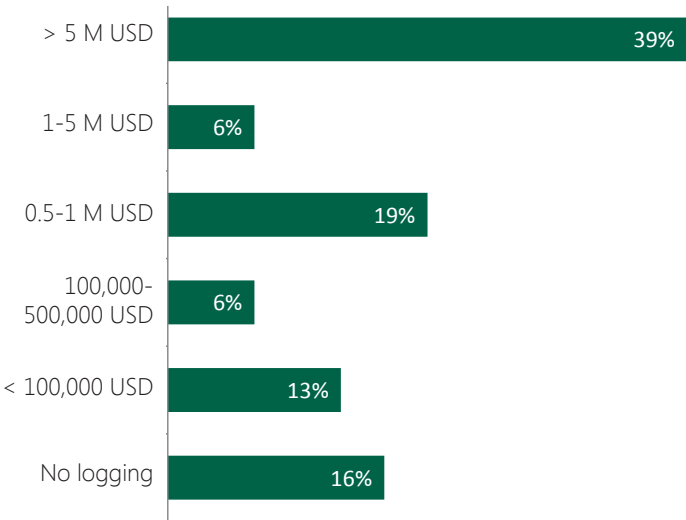


Figure 9: Turnover per company (31 observations)



well-defined market for timber from natural forests. The overall market situation is however highly variable among countries. In Vietnam and Paraguay, the timber demand is high and visited companies are able to sell their products on the domestic market at reasonable prices. In other cases, companies tend to focus more on export. This was the case in the Republic of the Congo, where this was due to low domestic prices that are partly related to competition from illegal timber on the market which institutions have to date made limited progress in fighting (see next section).

On the other hand, timber prices and distance to markets are assessed as barriers. This may be related to the fact that forests are often in isolated areas, which increases transport costs, and leads to unfair competition from illegal timber producers, which pushes timber prices down. Competition with illegal timber is actually identified as a barrier by over 60 % of the surveyed companies, particularly by African companies (all of them) and by forest owners as opposed to concessions.

Finally, although half of the surveyed companies receive external financing, the availability of financing options is considered as a barrier by over 60 %. During the on-site visits it was observed that in practice the identification of investment options is not a priority or a particularly urgent task for companies.

Environmental protection and biodiversity

Environmental issues represent an important aspect for companies given that most of them reported being located in high biodiversity ecosystems (65 %) or in biodiversity hotspots (15 %). The way companies manage and address environmental protection varies among companies. Whereas most of them (68 %) integrate the management of biodiversity and ecosystem conservation in their core forest production systems - for instance in the form of RIL practices and the protection of ecologically important sites, such as waterways, forage trees, and breeding locations - another 25 % reported managing

protection and production areas separately. Thirteen percent of companies are restoring degraded forests through their management (for production).

No company reported a negative impact on HCVF. Although a negative impact on threatened species appears to be uncommon, information on this is often unavailable (a quarter of companies have no data on this).

Restoration and conservation areas vary from being almost inexistent to constituting the whole area. On average, these areas represent 9 to 28 % of the total area managed by the company (this range includes 50 % of surveyed companies). This share does not represent a barrier for companies, in particular for bigger ones, mainly because available area for production is not a limitation in these cases. In the same way, required efforts for environmental impact monitoring are not seen as a barrier. On-site visits revealed that this task is often assigned to environmental NGOs and this cooperation is seen as successful by companies. Moreover, almost 90 % of surveyed companies are actually endorsed by environmental organizations. This explains why a large majority assess the relationship with environmental interest groups as a success factor.

It is noteworthy that 74 % of companies are involved in the management of protected areas (through direct support or as buffer areas). In the case of Indonesia, for instance, the engagement of the company in the establishment of a national park is part of their strategy to slow down deforestation and forest degradation, showing potential synergies with their own interests.

As for expenses relating to environmental protection, the annual expenditure of companies in restoration and conservation activities varies in the range of 120 to 520 USD per 1,000 ha of total area (the range includes 50 % of surveyed companies).

Figure 10: Analysis of economic performance (43 observations)

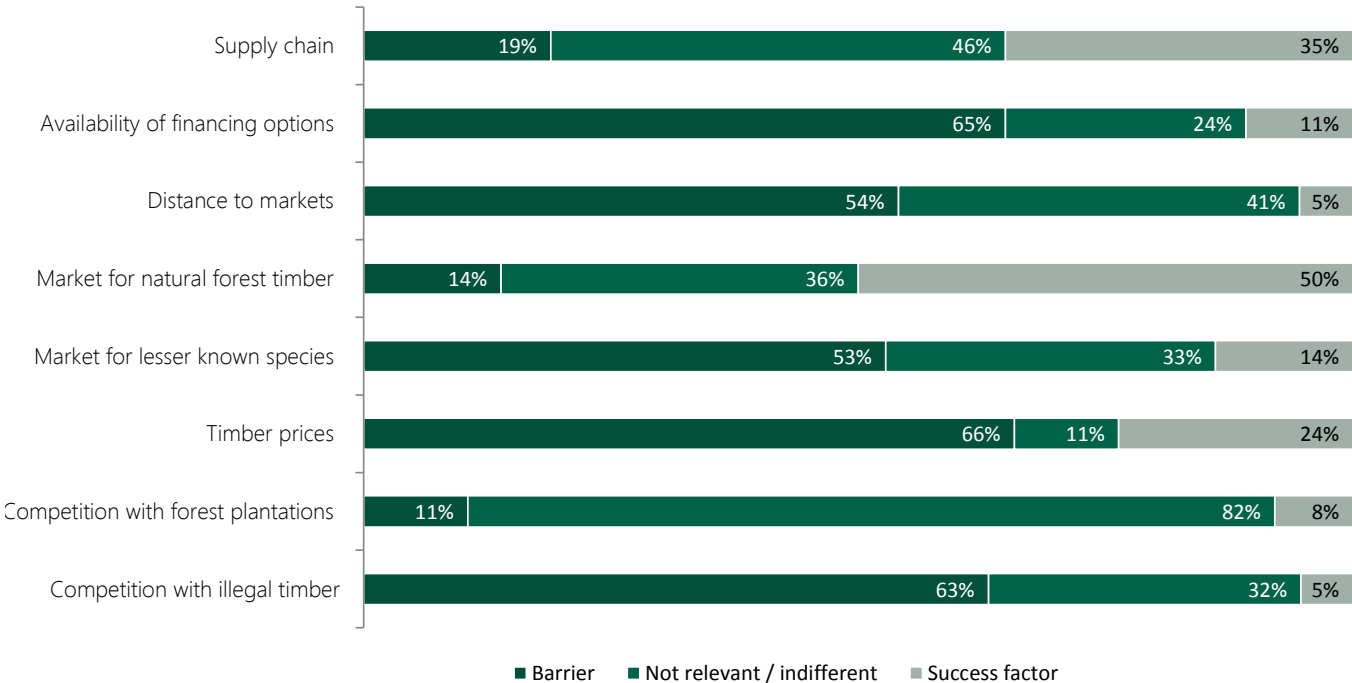


Figure 11: Forest location (left; 40 observations) and environmental impact (right; 41 observations)

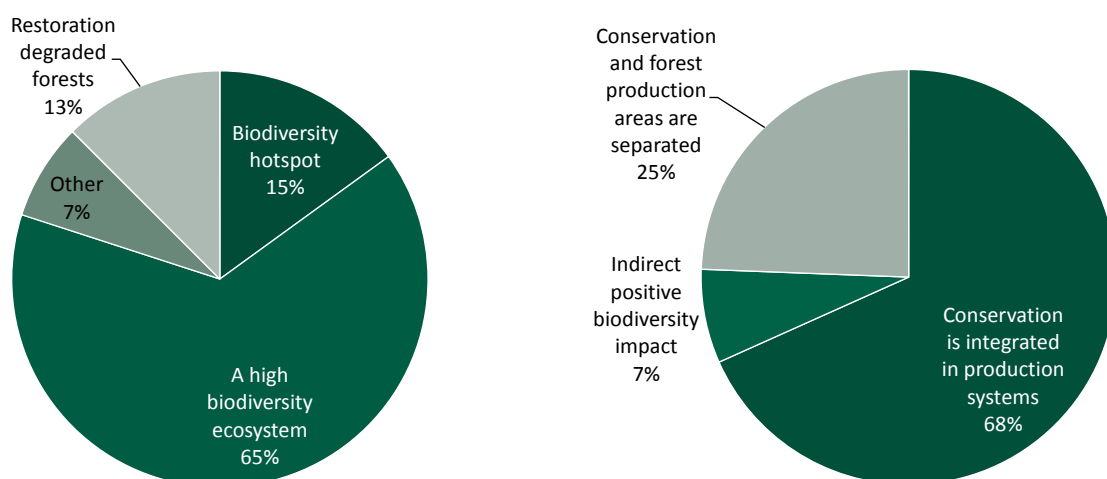
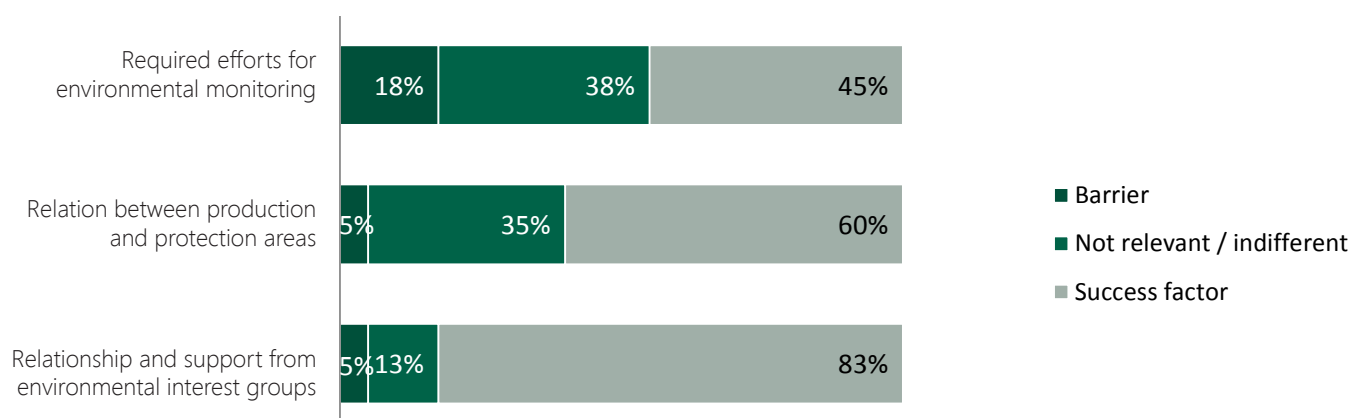


Figure 12: Assessment of environmental impacts (41 observations)



Employment and working conditions

Data collected on employment refer to forest management (forest operations and administration) and do not include processing operations or any other activities undertaken by the companies. Table 2 presents key information obtained from the survey:

The survey showed that the availability of skilled staff is a decisive aspect for companies, who consider this as either a success factor or as a barrier. Thus, capacity building provided is focused on technical skills and occupational health and safety (related to the inherent risk associated with forest operations). Whereas fluctuation of workers is considered to

be irrelevant by the majority of surveyed companies, those companies visited stated that the main driver of migration of workers is difficult working conditions linked to forestry. Companies compensate this with large investments in workers' living conditions and offering fair payments. Among others, the use of performance-based incentive systems is identified as a good practice to ensure workers' satisfaction and motivation.

Finally, most companies have a designated staff member for managing the relationship with workers, and conflicts due to working conditions are mostly considered to be irrelevant. Nevertheless, only a third of all companies reported that workers are members of workers organizations.

Item	Range	Observations
Permanent workers per 1,000 ha of net production forest	1 - 7	35
Permanent workers per 1,000 m3 of sold timber	6 - 35	30
Annual inv. in capacity building in USD per permanent worker	9 - 93	27
Annual inv. in capacity building in USD per direct worker	14 - 131	26
% of direct workers who are temporary	0 - 50 %	29
Fluctuation of direct employees	0 - 15 %	26

Table 2: Key data on employment by forest companies

Note: Ranges include 50 % of surveyed companies. In this case, direct workers are those directly engaged by the company (as opposed to those engaged by contractors or other third parties). Permanent workers refer to those having long-term or unlimited contracts (even if the contract only concerns part of the year) and include both direct and contracted workers.



Relationship with communities and socio-economic development

The population affected by the activities of the company varies largely among companies, with a range of 7 to 154 affected people per 1,000 ha of total area (this range includes 50 % of surveyed companies). The local population is mostly engaged in subsistence farming (see Figure 13) and in two thirds of the cases the population includes indigenous communities.

Almost all companies (over 80% in all cases) have designated staff responsible for the relationship with communities, involve local communities in the planning of forest management and have regular meetings. Actually achieving a high representation of locals in the workforce is part of the strategy of most companies, as this contributes toward gaining support and acceptance in the region.

The activities developed by companies are very diverse (see Figure 14) and include:

- Development of capacities, with a focus on environmental education.
- Development of public infrastructure.
- Establishment of cooperation agreements, particularly for the use of natural resources.

On average, companies invest 46 to 811 USD annually per 1,000 ha of total area in such activities. However, field visits revealed that the real impact of such investments remains questionable, partly due to deficient planning and follow-up of activities and partly due to a lack of institutions to support the regional development.

For the success of such activities, the existence of community organizations seems to be an important aspect. Furthermore, external support appears to be relevant, as the majority of companies cooperate with external organizations (74 %) and receive economic or technical support (51 %). Despite this, the incidence of conflicts with communities is assessed as a barrier by over 40 % of surveyed companies. According to the assessment and on-site visits, illegal logging activities and encroachment on forests are key aspects related to this perspective and these represent a high risk for the company. Cooperation with communities is essential to address this. As an example, in Vietnam

Figure 13: Economic activities of affected communities (40 observations)

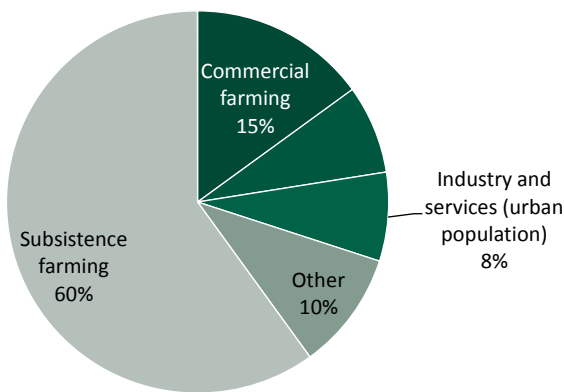


Figure 14: Activities for socio-economic development in the region (41 observations)

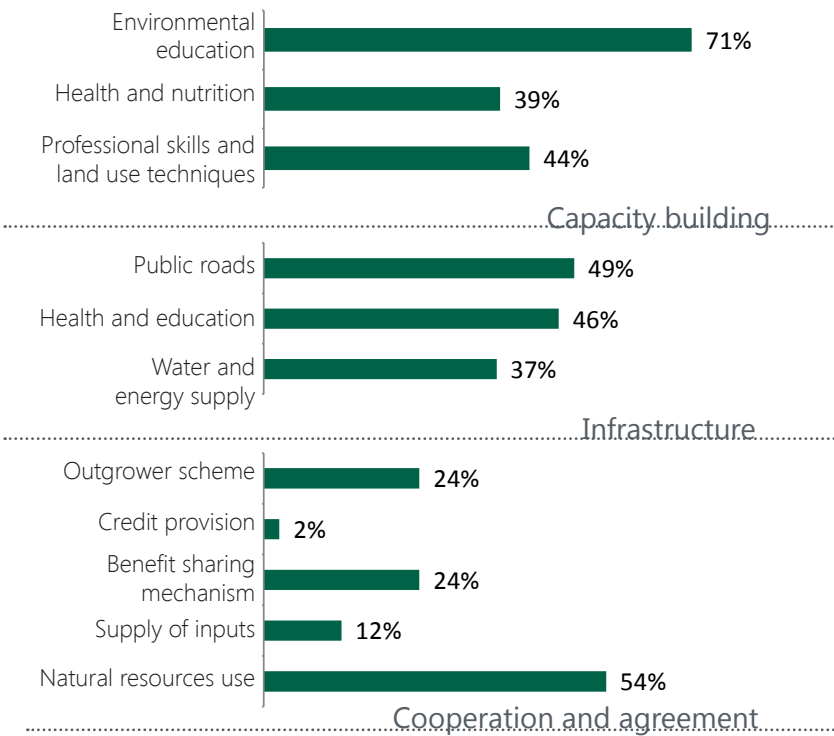
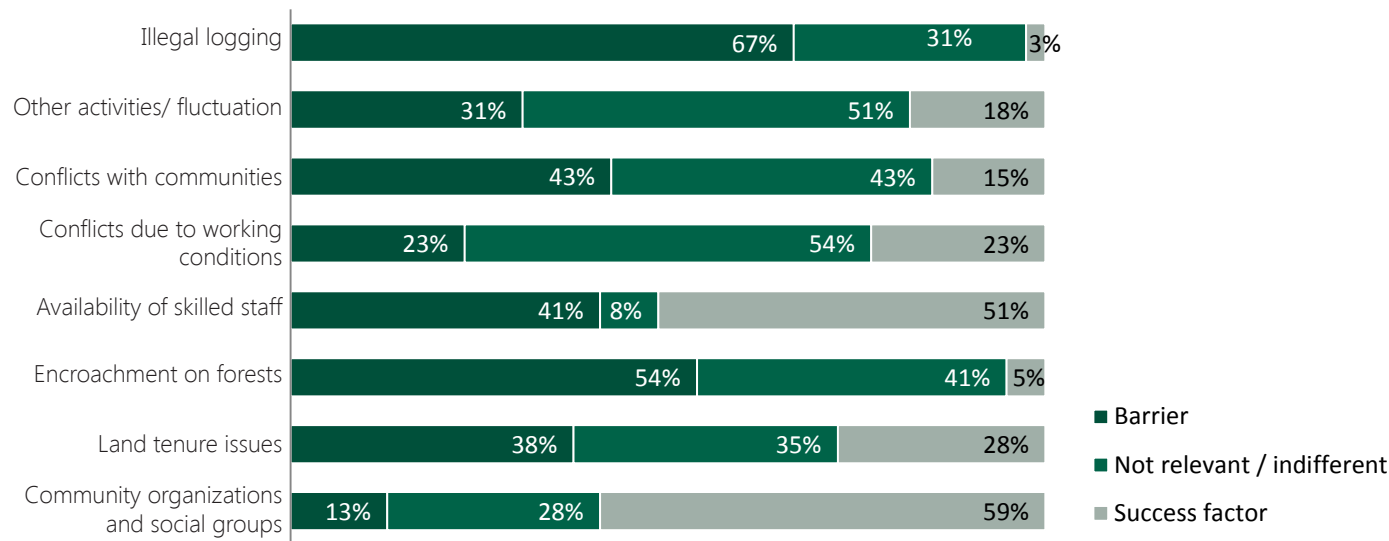


Figure 15: Assessment of social aspects (41 observations)



the establishment of forest protection contracts with the local population has significantly reduced this problem. Also, for African companies, issues related to land tenure seem to be a significant challenge.

Policy and institutional context

The relevance of all policy and institutional aspects was assessed as high or moderate by the majority of surveyed companies. This shows the importance of these aspects for the companies’ performance. The assessment of policy and institutions is nevertheless very dependent on the national context. On-site visits led to a greater understanding of this relationship in concrete circumstances and some general impressions could be collected (these issues are further discussed in the next section):

- Long-term and secure use rights are necessary in order for companies to apply treatments for the enhancement of productivity and to make long-term investments in upgrading the company (such as processing units).
- Political backing is necessary to support the forest sector in competition with other more profitable activities, such as agriculture and mining.
- Current procedures are often overruled and legislation is not in line with SNFM.
- There are no incentives for SNFM.

In particular, companies were asked about their awareness of and involvement in the REDD+ mechanism, as a mechanism that could support SNFM. Most surveyed companies are aware of the REDD+ mechanism (85 % of 39 companies) and a large share (46 %) are involved in its development in their countries. Moreover, more than 50 % of surveyed companies state that they generate or expect to generate carbon credits and consider the mechanism as an opportunity to obtain additional financing. However, during on-site visits it was observed that no concrete opportunities have been created so far.

It was also found that the majority of companies (63 % of 41 companies) are aware of regulations aimed at reducing the marketing of illegal timber (FLEGT and the Lacey Act). In 85 % of the cases, companies are located in FLEGT partner

countries and expect to export their products to the European Union. The majority of surveyed companies also state that FLEGT has had an impact on their operations and has increased costs. During on-site visits, however, companies explained that additional efforts to comply with FLEGT are not expected to be significant given that they are already certified companies. In some cases, a degree of pessimism was also observed because control of illegal timber marketing has been limited and a significant change in the short-term seems unrealistic.

Finally, with regard to forest management certification, the survey showed that the main reasons for companies to become certified are company philosophy and the market situation (see Figure 17). However, on-site visits revealed that very little impact on market prices or access is actually achieved through certification.

Long-term perspectives and replication options

Companies are optimistic concerning their long-term performance and a large majority assesses that this will improve in the future. Related risks are assessed differently by companies. Political and market risks seem to be more relevant for smaller companies and concessions, and companies located in Africa perceive lower political risks and higher market risks than those in Asian and Latin American countries. In general, over 70 % of companies see a potential to enhance their economic performance and social and environmental impacts.

It is noteworthy that over 90 % of surveyed companies think that their projects are replicable in the region and half of them are considering increasing their management area or implementing a similar project. Land availability due to natural conditions and institutional support (100 % of companies in Asia) are assessed as important opportunities for this. On the other hand, pressure from other land uses and land tenure appear to be significant challenges. In general, the support that may be provided by different stakeholders (including agencies for technical and financial support, as well as public and research institutions and NGOs) is assessed as an important aspect for up-scaling and replication.

Figure 16: Analysis of the relevance of national policy and institutions (41 observations)

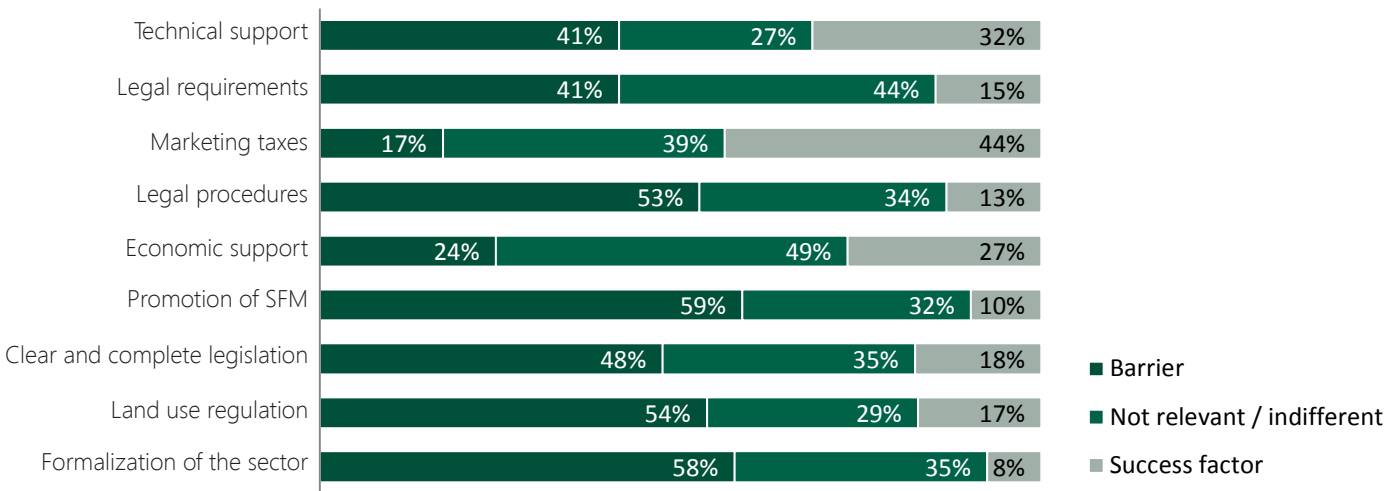


Figure 17: Motivation for certification (41 observations)

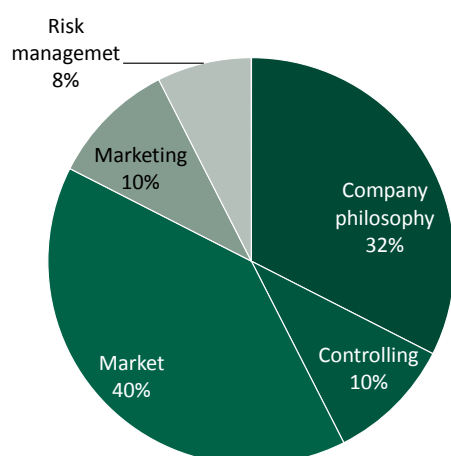


Figure 18: Assessment of long-term performance (39 observations)

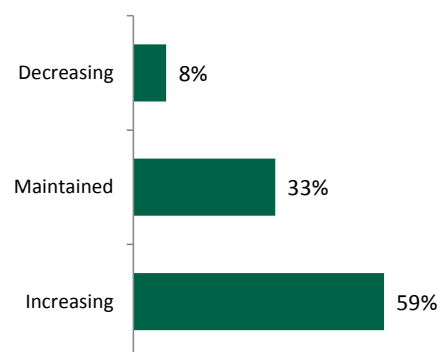


Figure 19: and risks related to long-term perspectives (41 observations)

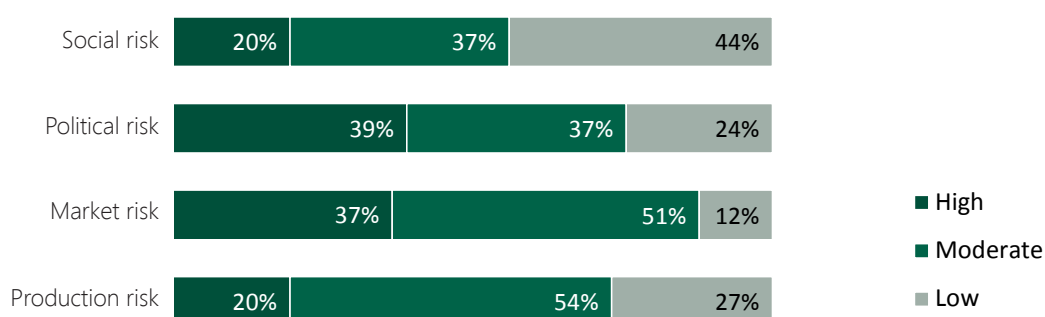
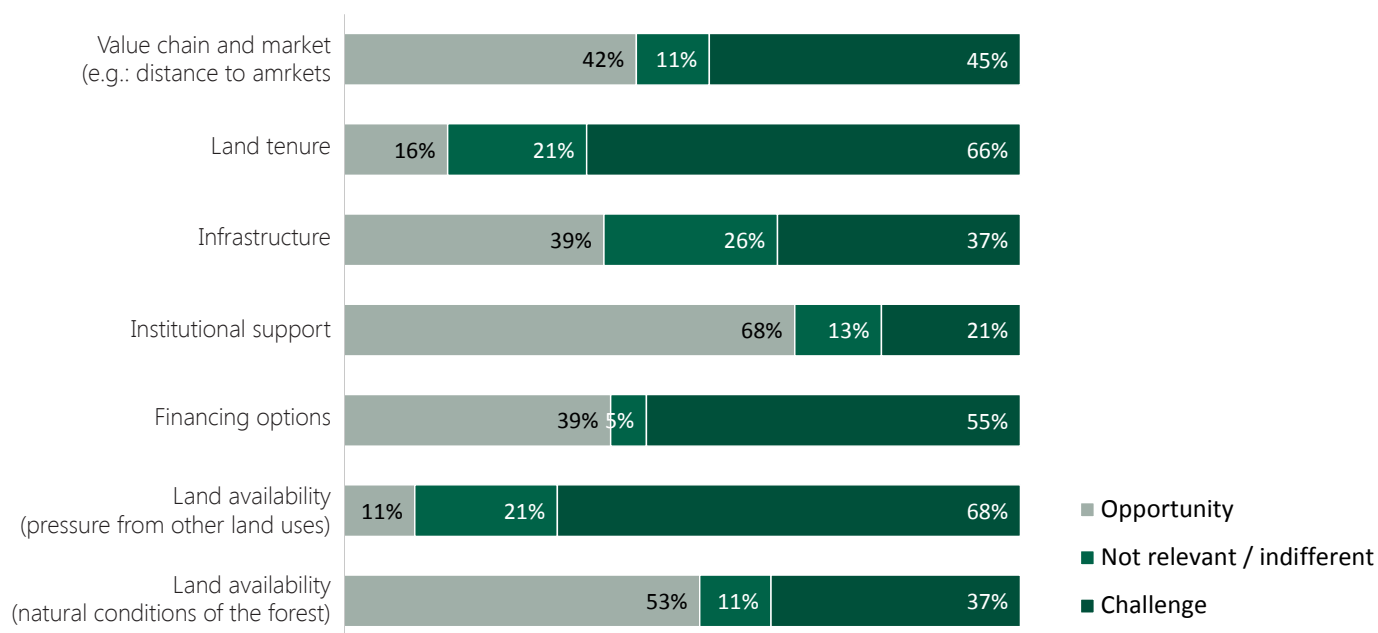


Figure 20: Challenges and opportunities for up-scaling and replication (38 observations)



Item	Best practices recommended by applied research (literature review)	Best practices implemented by companies (survey)
Silvicultural systems and practices	■ Polycyclic systems are most common approaches ■ Systems promoting PCTs have the highest impact on forest productivity and quality ■ Liberation thinnings are very effective (growth increase > 50%) ■ RIL is the most important practice	■ All companies apply polycyclic systems ■ Only 20% of companies apply treatments aimed at the promotion of PCTs ■ Only a few companies apply liberation thinnings ■ Application of RIL techniques is very frequent
Growth and yield and intervention cycles	■ Total MAI is very variable with values ranging between 1 and over 15 m³ per ha per year ■ Only a few species have commercial value (10 to 20) ■ Yields are low with values ranging between 0.5 to 2.5 m³ of commercial log volume per ha per year ■ Recommended intervention cycles are between 20 and 40 years	■ There is high variability in MAI but prevalence of low values, below 5 m³ per ha per year ■ Number of commercial species rarely exceeds 20. This represents a challenge for companies ■ There is high variability in yields but prevalence of low values; on average below 1 m³ of commercial log volume per ha per year ■ Intervention cycles are normally between 20 and 30 years
Economics and markets	■ Reliable data on economics are scarce ■ Only a small share of the tropical tree species are marketable ■ Marketing of logs is mostly at regional level ■ (Semi) final products target international markets ■ Main consumer markets are Asia, North America and Europe (where there are increasing concerns about legality)	■ Almost all companies sell products on the domestic markets and three quarters export ■ Agreements and cooperation along value chain are common practice ■ Difficulties exist to market lesser known species ■ There is a well-defined market for tropical timber but timber prices and access to markets are challenges ■ Illegal logging and sector informality are a main barrier to SNFM
Governance and legal aspects	■ No particular literature review conducted on this aspect	■ Long-term and secure use rights are essential ■ Political backing is required to compete with alternative land uses ■ No incentive systems are in place for SNFM ■ Current forest legislation is often not in line with SNFM
Environmental protection	■ SNFM includes delimitation of protection areas ■ There is limited impact of selective logging on carbon stocks and biodiversity ■ Identification and management of HCV forests is important but has limited applicability	■ Protection is often integrated in management systems ■ On average 9-28% of forest area is under protection ■ Environmental safeguards are not seen as a barrier ■ There is no negative impact on HCV forests (limited information on this)
Employment	■ Preference should be given to steady and local employment ■ Safety is crucial due to inherent risks of forest operations ■ Remuneration should be based on financial incentives ■ Access to basic needs is key due to remoteness of forest areas	■ Most companies are looking for local employees ■ Capacity building focuses on technical skills and health & safety ■ Performance-based incentives are in place ■ Large investments are done in workers' living conditions
Community relations	■ Integration and partnerships with local population are necessary ■ Mutual respect, trust, practicability and communication are key success factors	■ Activities include development of capacities, public infrastructure and cooperation agreements (use of natural resources) ■ External support and existence of community organizations are key success factors ■ Illegal logging and encroachment are key challenges



SUMMARY OF BEST PRACTICES

Applied research vs.
implementation practice

The analysis of survey results and on-site visits provided valuable information for understanding which best practices recommended by applied research are actually implemented on the ground, and to identify the most important success factors and barriers faced by forest companies. The table on the left gives a comparative overview of key information obtained from the literature review and primary information obtained from surveyed companies.

In a nutshell: With regards to best practices for SNFM in the tropics, there is a high degree of conformity between the recommendations of applied research and the actual implementation approaches of large-scale certified companies. However, some key aspects relevant for the long-term performance of SNFM are either not considered by companies (e.g. enhancement of productivity) or are out of their direct sphere of influence (e.g. forest legislation, illegal logging and sector informality, timber markets for lesser known species). These aspects represent challenges for SNFM and are discussed in detail in the following section.

4 CHALLENGES

Introduction

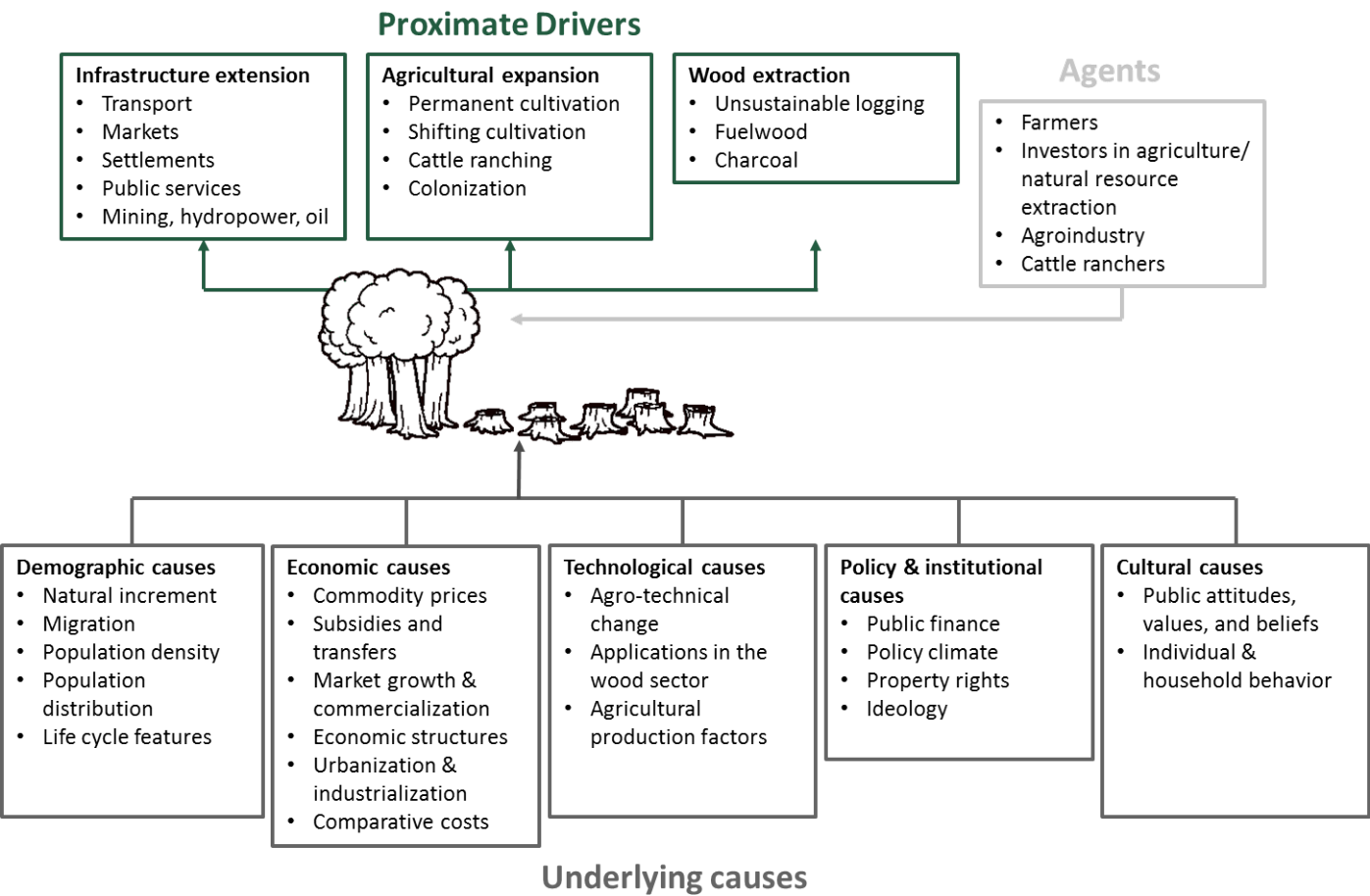
Based on the literature review, the survey and the project case studies, we identified key challenges faced by certified large-scale forest companies, which also determine the long-term perspectives of SNFM. These include opportunity costs, the enhancement of productivity, the successful sale of timber products, and governance and forest legislation. In this section, we analyze each of these aspects and suggest options for enhancement and best practices. Resulting investment opportunities are discussed later in section 5.

Opportunity costs of sustainable natural forest management

Relevance

Deforestation and forest degradation are driven by proximate drivers and underlying causes, such as a range of complex interactions between social, economic, political, cultural and technological developments (Hosonuma et al. 2012, see Figure 21).
Agricultural expansion is the major driver of deforestation globally, whereas forest degradation is mainly driven by unsustainable wood extraction practices. Unsustainably exploited

Figure 21: Proximate drivers and underlying causes of deforestation and forest degradation (adapted from Geist and Lambin (2001, 2002))



natural forests are utilized for timber and to a significant extent also for fuelwood. The latter quickly leads to heavy degradation most of the trees in the forest can be used for this purpose. Also, increasing market access usually results in increasing degradation if effective management structures and governance frameworks are not in place. These land use patterns have resulted in about 0.85 (Blaser and Thompson 2010) to 1.1 billion ha (WRI 2009) of degraded forests. Furthermore, there is a strong link between degradation and deforestation, because the more degraded natural forests are, the lower the opportunity costs of conversion into other land uses.

Interdependencies

SNFM is an extensive land use, like cattle breeding. Crop cultivation or intensively managed forest plantations have higher economic revenues per unit of land. Thus SNFM on land suited for agriculture and located in regions with access to markets is normally not the most profitable land use option. Under these circumstances, the most financially profitable option is to harvest the timber as rapidly as possible and then either abandon the area or convert it to a more profitable land use (Pearce et al. 2002, Fisher et al. 2011, Ruslandi et al. 2011, Persson 2012).

Figure 22 shows the key factors to be considered when assessing the economic rationality of SNFM. In the following cases, SNFM emerges as the most economically rational and competitive land use option:

1. Site conditions do not allow for crop cultivation. Thus, opportunity costs are not set by intensive agriculture but

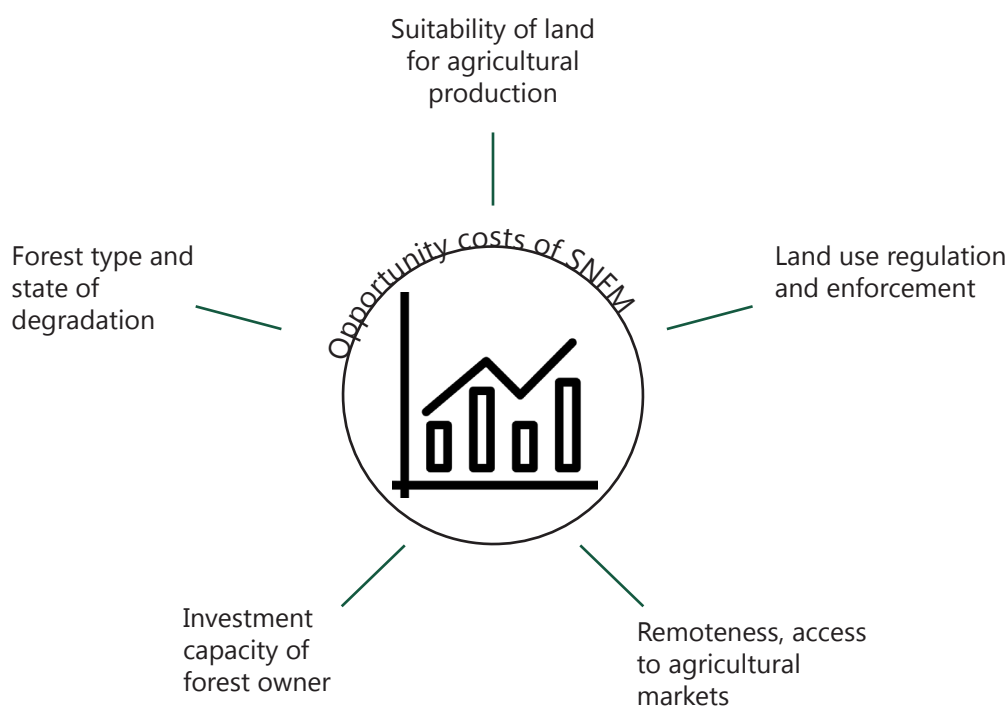
rather by cattle breeding. Well managed natural forests can generate revenues per ha that are competitive with cattle breeding (see case study Paraguay and Grulke et al. 2014).

2. Land use planning only allows forestry and the land use plan is enforced and implemented properly. In this case, the opportunity cost of not converting into agricultural land use is zero as there is no legal opportunity to do so.
3. The forest owner does not have financial resources for conversion into other land use. The cash flow profile of SNFM is attractive. It brings annual stable revenues and the initial investment is not very high and can often be covered with the returns in the first years. In contrast, conversion into other land uses requires an enormous investment capital in the first years.
4. The forests are located in remote and sparsely populated areas with poor access to agricultural markets. This is an important limitation for conversion as, in contrast to timber products, many agricultural products require a quick marketing following harvesting with a complex logistics chain. However, remoteness and accessibility to markets is highly dynamic. Areas considered as remote today might be located close to markets in the near future.

These scenarios are confirmed by our survey results: 70 % of the companies stated that their forest land is unsuitable for agriculture and in 87 % of the cases forestry was the only legal form of land use.

Besides this economic rationale, it can be assumed that a good share of the forest companies follow this line of business because of their adherence to the forestry and timber pro-

Figure 22: Opportunity costs of sustainable natural forest management



cessing sector. They do not seek financial profit maximization when comparing all potential land use options, but instead the optimization of their forest production. These strongly sector enrooted companies may play an important role as change agents for implementing innovations on a managerial and technological level.

Options for improvement and best practices

In the framework of REDD+ many tropical countries are in the process of analyzing the drivers and causes of deforestation and forest degradation and are designing their national strategies, programs and action plans in a phased approach¹⁰. Kissinger et al. (2012) reviewed 31 national REDD+ Readiness Preparation Proposals under the World Bank's Forest Carbon Partnership Facility and identified 19 major intervention strategies related to forestry, including sustainable forest management, fuelwood efficiency, FLEGT and community forest management. Proposals identified sustainable forest management as the most common intervention, with specific activities related to inventories, forest management plans, improved silvicultural management, forest certification and improved concession management.

Thus, where opportunity costs are high, political will, forest governance and law enforcement are crucial for promoting investments in SNFM because natural forests cannot compete with other more intensive land uses. This is particularly relevant for degraded forests. In these areas, REDD+ related public investments may enable the private sector to restore the economic potential of forests and increase the opportunity costs of further degradation and subsequent deforestation. In areas with low opportunity costs, private investment may be attractive. However, an enabling environment in terms of good forest governance and law enforcement is required in order to prevent competition between illegal or unsustainable forest extractions and sustainably produced timber.

Conclusions

There are situations where SNFM is the most economically reasonable land use option. In remote areas, on land unsuitable for agricultural production or on land classified "only for forest use", SNFM is an attractive option for generating revenues and conserving the forests with their environmental benefits. Under these circumstances, forest conservation through sustainable utilization works and is driven by economic rationale.

However, in areas with good market access and high population pressures, SNFM cannot compete economically with agricultural production when site conditions allow for crop cultivation. In these areas, forests will only exist on marginal land or through enforced and proper implementation of regional land use planning designating a certain percentage of natural forest area. In other words: significant areas of natural forests as a landscape element can only be maintained through political decisions. Still remaining forests in these areas are often highly degraded due to their accessibility. The spa-

tial importance of degraded forests is already enormous and will continue to increase. To maintain natural forests, managed or unmanaged, in close-to-market areas will require political will, significant public and private investments, and intelligent restoration concepts. Restoring the production capacity of degraded forest areas is all the more important as timber demand is highly correlated with population growth, which will continue in coming decades, so degraded forests will become important for forest production in the future. Furthermore, since forest plantations are competing more and more with agricultural production, making intelligent and sustainable use of degraded forests is a must for reconciling the need to ensure food security with the increasing demand for timber.

Enhancement of productivity

Relevance

The productivity of managed natural forests is the key aspect to determining the sustainable harvesting volume. Enhancing the productivity through targeted silvicultural treatments allows for higher harvests with the following positive impacts:

- Improved long-term economic performance of the forest company.
- Greater competitiveness against other land use options through a reduction of opportunity costs.
- Creation of more jobs to conduct the silvicultural operations without increasing the managed area.
- Stable supply of raw material for the timber processing industry. Given that the first processing steps are normally conducted at a regional level, this is important for rural development.

Despite this, the survey revealed that less than 20 % of companies conduct liberation thinning or elimination of decaying trees, showing that in practice very few companies apply measures to enhance the productivity of their forest resources.

Interdependencies

The productivity of natural forests is linked to biological, technical, economic and political aspects, as illustrated in Figure 23.

The decisive biological factor determining forest productivity is forest type, which is the combined result of climate conditions, soil quality and topography. The biological production potential is superposed by anthropogenic interventions, which can result in either the enhancement or reduction of forest productivity. When appropriate silvicultural knowledge is applied, forest productivity will increase. When unsustainable forest utilization takes place, the forests enter a degradation process which has a negative impact on their productivity.

As mentioned in section 2, the productivity expressed by the MAI varies between 1-2 and 15 m³ per ha per year as a function of the forest type. However, without the application of intelligent silviculture, the actual growth will remain up to 50 % behind the site-given potential. The survey showed that 75 % of companies record MAIs below 5 m³ per ha per year and that only a few have a clear concept of how to enhance

¹⁰ Phase 1 (Readiness): Development of national plan, policies and measures, and capacity building. Phase 2 (Implementation): Implementation of national plan, policies and measures, and demonstration activities. Phase 3 (Performance): Results-based actions with full measurement, reporting and verification.

ce growth and yield. As a consequence of lacking silvicultural practices, the intervention cycle is very long (87 % $\geq$ 20 years, 59 % $\geq$ 30 years). This is justified by a required volume of harvestable timber when returning to the area. The cycles could and should be shortened significantly if silvicultural treatments were to be applied.

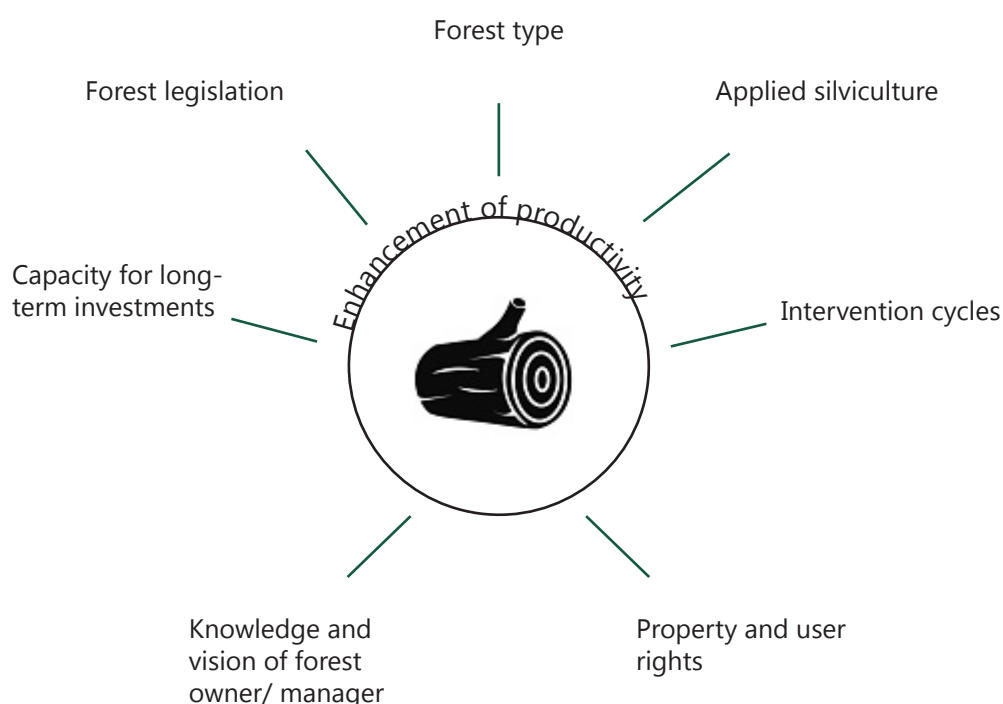
The presence or absence of silvicultural treatments depends on property rights, size of the managed area, vision of the forest owner or concessionaire, and financial capacity. In concession schemes (the most frequent case for natural forest management) the concessionaire normally has no incentive to enhance productivity, since he will only harvest the assigned area once in his lifetime. Large concession areas (up to > 1 million ha) are still quite normal. The availability of large areas promotes the perception that productivity (in terms of produced timber per ha) is not an important performance indicator. The hypothesis that concessionaires invest less in productivity enhancement than forest owners is supported by the survey results: Only 11 % of the concessionaires have a consistent silvicultural concept to enhance productivity whereas this percentage is twice as much for companies owning the forests. In other words: the separation of resource ownership and management ownership jeopardizes the application of productivity enhancing measures. Nevertheless, only a minority of forest resource owners apply these measures.

Presumably some do not do this because of a lack of forestry knowledge and vision and others because of insufficient financial resources.

Last but not least, political aspects also influence the production capacity of natural forests. The proportion of production as opposed to protection forest set by national regulations, by certification bodies or by the company's own policy has a direct impact on the annual sustainable cut. Outdated forest legislation that is intended mainly to control traditional exploitation companies and does not consider the requirements of SNFM has a very negative impact. In this context, the most frequent shortcomings are:

- The definition of a minimum harvesting diameter which impedes thinnings.
- The definition of long intervention cycles, ignoring the fact that silvicultural effects do not last for 30 or even 20 years.
- The definition of seed trees with a relatively large minimum diameter. This does not consider that semi-mature trees with good individual properties are better suited to producing high quality seeds
- The no consideration of sanitary thinnings (cutting of trees with no commercial value due to timber species or individual characteristics) when fixing the allowed annual cut. This represents a negative incentive for conducting cuts of non-commercial trees to improve the quality of the forest.

Figure 23: Interdependences of enhancement of forest productivity



Guarantee of permanent regeneration of all timber species	■ Conducting post-harvest interventions to create best conditions for natural regeneration ■ Tending of natural regeneration
Selection and consequent enhancement of PCTs, which assures the long-term productivity of the forest	■ Marking of PCT during pre-harvest inventory ■ Liberation thinning: elimination of PCT competitors. If competitors can be utilized they should be harvested. If not, standing elimination by girdling or application of arboricides is a better option because of lower costs and less damage to the remaining forest ■ Consistent application of RIL techniques
Reduced felling and skidding damage to remaining forest, particularly on PCTs	■ Consistent application of reduced impact logging (RIL) techniques.
Ensuring that tree species composition is not shifted toward a lower participation of commercial tree species after the intervention	■ Step by step elimination of mature trees of non-commercial tree species. If these trees can be utilized (e.g. energy) they should be harvested. If not, standing elimination should be applied
Shorten intervention cycle	■ More frequent interventions with lower intensity (every 10 to 20 years)
Allocation and monitoring of concessions	■ Allocation of concessions only when a coherent silvicultural concept is presented ■ Duration of concessions of a minimum of two intervention cycles ■ Effective on-ground monitoring of applied silviculture by forest authorities
Actualization of forest legislation	■ Promotion of sanitary cuts and elimination of competitors: define the maximum basal area which can be removed in one intervention and then classify it according to commercial trees, sanitary cut of non-commercial trees and elimination of competitors ■ Promotion of shorter cycles, but less intensive interventions

Table 3: Options to enhance productivity

Options for improvement and best practices

One of the main drivers of forest productivity is site conditions, which determine the forest type. Natural processes can alter site conditions only very slowly. At the same time, options for short-term improvements exist (e.g. irrigation when rainfall is lacking or fertilization of soils) but are not applied in natural forest management.

As mentioned in section 2, there are scientifically proven silvicultural measures to enhance productivity. The most important are summarized in Table 3. The table also summarizes the economic and political options relevant for productivity enhancement.

Conclusions

The enhancement of forest productivity is a key factor for the sustainability and competitiveness of SNFM. To increase the economic potential of natural forests in terms of growth and yield, species composition and tree quality, a set of best management practices has to be applied. However, only few companies are currently implementing these best practices to enhance productivity. The main barriers are:

- Lack of incentives: The forest manager comes only once in his professional lifetime to the same area due to an oversized management area and/or to the special set-up in concessions (concessions often being shorter than intervention cycles). As a consequence, there is no need for him to guarantee productivity for future harvesting.
- Lack of knowledge and visions: Silvicultural knowledge is not broadly held by managers of natural forests. Even less so is the vision that productivity has to be enhanced in order to guarantee a competitive land use option. This lack of knowledge presumably has two main reasons: i) many investigations into silviculture in the tropics have been carried out by the international research community without

any clear concept of how to disseminate the results or to scale-up trials to business; ii) managed natural forests are in remote regions. To convince excellent managers to work in these regions for years is difficult, especially when incentivizing with top salaries is limited due to sector-given limitations.

- Outdated forest legislation: There are still many legal regulations in place that impede SNFM. The most harmful is the prohibition against cutting trees whose diameter size does not indicate maturity. This bans the interventions in the lower diameter classes that are necessary to enhance the growth of PCTs.

A more positive aspect of the aforementioned barriers is that all of them can be managed. They can provide excellent guidance as to which activities can be undertaken in order to achieve a positive impact on growth and yield in SNFM.

Successful commercialization of forest products

Relevance

A favorable market environment and market intelligence are crucial for the economic success of SNFM. The production and sale of timber products, mainly the production of high quality logs, is the main economic activity of large-scale companies managing natural forests. NTFPs and PES still play a limited role. The survey showed that 44 % of companies produce products other than those which are purely timber-related, but it can be assumed that the contribution of these to the total revenues is generally marginal. Among the case studies, alternative products only played a role in Vietnam, where a regulated PES market (in this case, payment for clean water) contributes significantly to the income.

Interdependencies

Figure 24 shows the main factors impacting on successful product sales of large-scale natural forest companies.

Forest companies have different market strategies. This involves diversity of products, the level of integration of the value chain, and diversity of markets (domestic and international) and clients. The market strategy of a forest company is determined by both internal aspects (depending only on its strategy) and external aspects (depending on the market environment and mega trends) which are interrelated. Single companies only have some influence on regional timber markets and nearly none on international markets. Therefore, the current market situation in terms of product definition (species, dimensions and quality), absorptive capacity (under or over saturated) and prices is crucial for successful product sales.

The survey showed that there is a proper market for natural forest timber, which is not in competition with forest plantation timber (only 10 % of the interviewed companies considered this as a barrier). This is mainly due to:

- Different quality of the timber: high quality from natural forests and standard quality from plantations.
- Different clients and value chains for natural forest timber and plantation timber.
- The absence of forest plantations in regions where a lot of natural forests are still used for timber production.

Differences exist as well in prices for logs (the main product of SNFM). Companies reported values between 40 and 420 USD per m³ at forest road, with 109 USD as the median, which is twice as high as prices paid for eucalypt or pine saw logs (around 40-50 USD). The relatively favorable prices are also confirmed by trends over recent years, whereby the demand

and prices for timber products from natural forests have increased.

Despite this, timber prices and access to market with regard to market distances are often seen as challenges. The forest sector is indeed sensitive to transport costs (the ratio of price to volume is low) showing the necessity to increase the value of products. This was implied by surveyed companies, who often targeted investments in processing units. Likewise, relationships with clients and other market agents are important for ensuring the sale of products, reducing market risks and increasing stability in the medium and long-term. The survey showed that these are common practices. On the other side, certification (in this study FSC® or PEFC) was not seen as providing a market advantage. No higher prices for certified products are paid, and access to additional markets insisting on certified products is not significant. This was confirmed by all companies included in the study. Mechanisms such as FLEGT and the Lacey Act may reduce this challenge by limiting the marketing of illegal timber.

Two mega trends which may substantially alter the markets for natural forest timber are: i) the substitution of natural forest timber with non-timber products or plantation timber due to the insecure supply of material for the processing industry; and ii) expanding logging bans for natural forests because the forest sector cannot demonstrate convincingly that forest protection through sustainable utilization works.

Two main challenges arise from the survey and the case studies:

- Promotion of secondary timber species: The market demand is focused on only a few timber species. This results in a significant number of tree species and standing timber volume having no commercial value. Moreover, in cases where selective logging has been conducted in

Figure 24: Interdependencies of timber market



Option	Best Practice
Diversification of products	■ Cooperation with research institutions and timber processing industry to test less known species. ■ Increased utilization of forest residues. ■ Integration of processing units to add value to the products. An in-depth study is essential to assess limitations. ■ Diversification of income through other financial options such as NTFPs or PES, including direct REDD+ payments. This can only generate an add-on revenue stream though. The main business is and will remain timber.
Diversification of markets and clients	■ Commercial agreements and long-term contracts with clients. ■ Cooperation with industry (joint definition of products). ■ Balance national and international market share.
Regional development	■ Development of an infrastructure that makes it possible to minimize the distance to markets. ■ Cluster development.
Institutional and legal support	■ Greater control of illegal logging. ■ Promote formalization of the forestry sector. ■ Greater control of corruption.

Table 4: Options for improving successful product sales

the past, these secondary species may represent a high proportion of harvestable volume. This indicates that harvests in former times were focused on the few merchantable timber species.

- Reduction of illegal logging: Illegal logging is a main challenge for most companies (over 60 % of surveyed companies identified competition with illegal timber on the market as a barrier to their economic performance). Illegal timber can be sold at lower prices because only harvesting costs are allocated to the product. This leads to timber market distortions. This is a problem especially for certified companies following strict standards, but also for all legally producing forest companies.

Options for improvement and best practices

One of the main risks for a company is the fluctuation of prices and demand on the timber market. Product diversification reduces risks and increases the resilience of the company by generating more flexibility and ability to adapt and react to the market situation. However, diversification also includes the risk that clients do not respond as expected with regard to the new products and that the company goes into production / processing schemes without having the required expertise and experience.

We see the following opportunities:

- The introduction of secondary species to the market can be a big opportunity to diversify production and to increase income per ha and reduce production costs. In order to introduce new timber species to the market, cooperation with processing industries and research institutions is essential. The difficulty in introducing less known species to the market should however not be underestimated. Research on timber properties requires time and resources. Also, the risk is quite high given that the actual limited use of a species will often be related to characteristics that do not meet industry requirements (timber properties) or to

production-related forestry aspects (tree architecture, e.g. only short stems).

- Integrated processing can add value to low price products (e.g. small logs and secondary species). A valid option for increasing the economic performance of a forest company can be its own processing units. In the cases of the companies visited in Paraguay and Vietnam, mobile saw mills helped to merchandise residuals and generated additional revenues. However, the integration of the value chain has to be well planned so that it actually results in adding value and not in adding deficit.
- FLEGT and the Lacey Act may reduce illegal logging by limiting the marketing of illegal timber in export markets. We consider this aspect important as 75 % of companies export their products and 85 % expect to export to the European Union. Certification may be linked to FLEGT (e.g. positive experience with FSC® in Cameroon) to avoid additional requirements for companies already implementing SNFM.

Table 4 presents options and good practices for improving successful product sales.

Conclusions

Value-generating marketing is crucial to make the “forest protection through sustainable utilization” approach work. However, there are still a number of significant challenges. The first big challenge is to reduce illegal logging which accounts for 50-90 % of the volume of all timber in key tropical producer countries and 15-30 % globally (Nellemann and INTERPOL 2012). Of these illegally sourced logs, an unknown percentage of high quality timber is exported to wood processing hotspots in Asia, Europe¹¹ and North America. The second big challenge is to market the so-called secondary timber species. On the one hand, this helps to increase economic performance of the companies because of a broader and bigger product portfolio. On the other hand, it is essential for avoiding a continuous degradation of the forests that is brought about

¹¹ For instance, estimates for Germany indicate that roughly 1-2% (equivalent to around one million m³) of direct timber imports from tropical countries originates from illegal sources. This estimate does not include indirect imports of processed wood products (e.g. furniture from Asia) and imports from Eastern Europe and Russia (Nellemann and INTERPOL 2012).

through concentrating logging activities on prime timber species. Finally, forest companies in the tropics often integrate timber processing industries. As we have seen in the case studies in Indonesia, Vietnam, and Paraguay, combining raw material production and processing facilities ensures raw material supply and quality, and can improve the rate of return. In section 5 we will come back to the discussion as to whether or not the capital required for timber processing facilities can trigger substantial private investments with the direct co-benefit of reducing deforestation and forest degradation.

Governance and forest legislation: enabling environment

Relevance

Governance and forest legislation defines the framework in which forest companies operate. Forest legislation determines the operations that can be performed as well as the required procedures. Forest companies are also affected by international policies and conventions, such as FLEGT, CITES or internationally accepted performance standards for investments.

In addition to forest legislation and conventions, other key aspects regarding enabling environments for SNFM are as follows:

- No or only unclearly documented traditional user rights, land tenure, or allowable land use practices lead to insecurities regarding the long-term persistence of natural forests and regarding possible restrictions on performing SNFM.

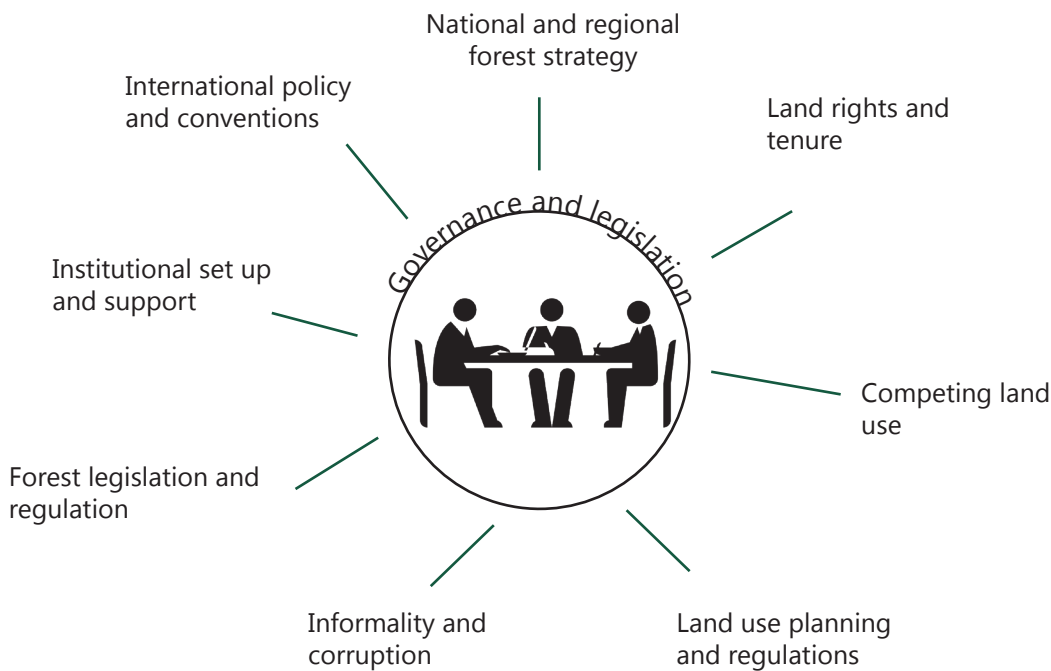
- Most of the tropical countries have a prominent informal sector and often suffer under weak institutions susceptible to corruption. Due to remoteness of the management units and limited accessibility, informality and corruption are particularly present in the forest sector.
- The overall legal and policy environment is a key factor for sustainability and transparency and therefore of utmost importance for investment decisions.

Interdependencies

Figure 26 shows the main drivers of an enabling environment in relation to governance and legal issues.

One of the biggest challenges faced by most tropical countries is the loss of forest areas through conversion to other land uses, mainly to agriculture (also refer to the discussion on opportunity costs earlier in this section). At the national or regional level, the forest strategy implemented by the government and land use regulations will define the role of forests and their interaction with other land uses. This also includes land use rights, which are a determining factor given the long (20 to 30 years) intervention cycles applied in managed tropical natural forests. Land use regulation and the promotion of SNFM through policies and institutions were actually assessed by over 50 % of surveyed companies as highly relevant to their success. Moreover, forest regulations and procedures, as well as forest institutions, have a direct influence on the daily activities and management implemented by a company. Regulations determine permitted activities (as well as the intensity of these) and all necessary administrative formalities. Consequently around 50 % of surveyed companies indicated that having clear and comprehensive legislation and

Figure 26: Interdependencies of governance and forest policy



legal procedures are highly relevant to the success of their management. Institutions are responsible for granting permits needed for harvesting and they control activities implemented by the company. They are also the link between companies and policy makers. Still, the assessment of current policies and institutions varies widely among countries because it is highly dependent on the national set up and circumstances. In general, institutions are seen as a key stakeholder and institutional support as an opportunity with regards to up-scaling and replication options. Finally, international policies, conventions and institutions also interact with natural forest companies. Mechanisms promoted at the international level, such as PES and REDD+, can offer additional financing and upgrading opportunities for companies. In Vietnam, a PES mechanism is in place and the income received from this by forest companies is significant. However, international regulations on timber trade, such as FLEGT and the Lacey Act, are considered as much more important for large-scale companies. As such, their business is based principally on timber sales and the proportion of exported products is quite high (75 % of the surveyed companies export part of their products). International cooperation agencies also have an important role as providers of advice and support to both forest companies and institutions. Over 60 % of surveyed companies assessed the role of agencies in providing technical support as highly important for up-scaling and replication options.

Options for improvement and best practices

First of all, there is huge potential to improve the cooperation between forest companies and forest institutions and authorities:

- As mentioned in previous sections, forest legislation is often not in line with modern and innovative SNFM. Forest

companies exercising SNFM can provide forest authorities with important information on legislative deficits.

- Forest companies are often located in rural and isolated areas and are expected to contribute to the development of the region. Experiences from the case studies show that forest companies are often overburdened with this expectation. Also, regional development cannot rely exclusively on forest companies, because they do not have the financial resources and/or the necessary skills (regional development experts) to fulfill this task. Development strategies should be commonly defined and favorable partnerships should be established.

Secure long-term use rights are a basic necessity for the implementation of silvicultural treatments that enhance the productivity of natural forests. Clear land tenure and linking companies' economic performance to future productivity of the forest is crucial. Regarding land tenure and land use rights respectively, there are legal instruments that favor long-term forest management. For example, in Paraguay there is a law which enables separate ownership of the land and forest resources ("suelo y vuelo forestal") and documents register the rights of forest managers. Regarding the maintenance of forest productivity, only one realistic option is considered: a forest company has to harvest the same forest area several times. There is no better incentive for enhancing productivity than knowing that in some years one has to return to a given forest area and will only harvest what has grown between the former intervention and now.

Also questions relating to remoteness and informality should be addressed:

- Consistent national land use planning is essential for forestry. The clear delineation of forest land which cannot be converted to other land use facilitates the implementation of long-term forest production. For instance, positive ex-

Option	Best Practice
Up-to-date and complete legislation and effective and easy procedures	■ Continuous exchange between institutions and companies; companies should proactively launch the dialogue. ■ Decentralized and autonomous forest institutions (positive experience in the Republic of the Congo).
Promotion of long-term productivity of natural forests	■ Legal instruments for secure user rights (positive experience in Paraguay). ■ Long-term permits for management over more than one intervention cycle. ■ Legal requirements pertaining to silvicultural treatments.
Formalization of the forestry sector	■ Adherence to international standards and certification schemes. ■ Banning illegal timber (e.g. through successful implementation of FLEGT). ■ Engagement of external stakeholders (investors and agencies) to increase transparency. ■ Efficient monitoring and evaluation. ■ Procurement policies of institutions and agencies.
Regional development	■ Definition of a development strategy involving all concerned stakeholders using permanent platforms (round tables, forums). ■ Cooperation with local population through co-management and outgrower schemes (positive experiences in Vietnam and Paraguay) to involve them in forest management. ■ Support to companies to play a role in regional socio-economic development; public-private partnerships (PPPs) involving companies, institutions and social NGOs may be an effective option.
Adequate international policy and cooperation	■ Reality check of implemented instruments (REDD+, FLEGT) and subsequent adjustments if necessary. ■ Enhancement of technical cooperation for relevant issues (e.g. effective land use planning, silvicultural management, proactive product marketing) and creation of platforms for experience and knowledge transfer. ■ Support in market development and regulatory framework for PES.

Table 5: Options to improve the enabling environment relating to governance and forest policy

periences have been made in Argentina with a very simple land use categorization using three color categories: i) the green category indicates that the land owner can do what he wants in the area; ii) in the yellow category only forestry is allowed, conversion of natural forests into forest plantations is excluded; iii) the red category refers to fully protected land, no commercial activities are allowed.

- Legality and formality are crucial for creating a favorable environment for forest investments, which basically requires transparency and security. Steps towards legalization and formalization of the forest sector by the companies can partly be achieved through consistent compliance with the national legal framework. However, legalization and formalization processes require time and in many countries these processes are at a very early stage and will take some decades.

Finally, international policies and conventions should be more adapted to the actual conditions in forest companies. Instruments like REDD+ and FLEGT, which target tropical forest protection are known by nearly all surveyed forest companies and were assessed as positive opportunities. However, deeper discussions with forest managers showed that in the actual operating environment for sustainable forest management these instruments do not lead to a concrete impact, and they are not expected to do so in the future. The processes triggered by these instruments are still mainly on a conceptual and policy level. It may require much more time before the

impacts of these processes trickle down to natural forest management companies.

The most relevant improvement options and good practices are summarized in Table 5.

Conclusions

The forest sector and particularly natural forest management has traditionally been very informal and susceptible to corruption. This is not only related to the lack of land use planning and law enforcement, or to illegal logging activities, but also and mainly due to the fact that there are beneficiaries along the chain of non-transparency. Beyond ethical aspects, illegality and non-transparency leads to distortion in the timber market, disadvantaging companies which are producing on a legal and sustainable basis. These companies have higher production costs and have to sell their product on the same timber markets with the same prices. The often discussed premium price for certified timber is more of an aspiration than a reality. Additionally, non-transparency and informality makes it difficult to attract international investors. Serious investors need clear and transparent business models and are very sensitive regarding reputational risks.

The above mentioned improvements to the enabling environment are a crucial step towards attracting private investments in SNFM. This will be discussed in greater detail in section 5.

5 INVESTMENT OPTIONS

Investment landscape in the forest sector

Awareness of the key role that forests play in addressing global challenges such as climate change mitigation, biodiversity conservation and poverty alleviation, has increased considerably in recent times. And yet this has not always been translated into a more profound consideration of how to improve financing for the forest sector. The promotion of sustainable forest management in general, and of sustainable timber production in natural forests in particular, needs to be considered more by national and international public and private investments.

The private sector can actually play a huge role in financing SNFM, and there are an increasing number of potentially interested investors. Private sector investments related to green economy and sustainability have seen strong growth rates in recent years, showing that investors are increasingly interested in the socio-economic and environmental benefits of their investments in addition to their economic performance. In Europe alone, investments in sustainability¹² increased from 7 billion EUR in 2005 to 48 billion in 2011. In particular, investments in the forest sector are increasingly recognized as a valuable long-term capital investment. Forest investments are attractive because they offer a good balance between risk and revenue, provide crucial climate and biodiversity benefits, and foster rural socio-economic development. Estimates indicate that between 70 and 160 billion USD are invested in forestry as an asset class, and investments are made mainly by commercial investors. However, investments in forestry have to date had a strong focus on highly productive planted forests and most often target mature markets, such as North America and Australia.

Figure 27 gives an overview of the investor groups and typical investment vehicles with regard to potential investments in the forest sector.

There are generally four groups of investors, which can be classified according to the considerations that principally drive their investments:

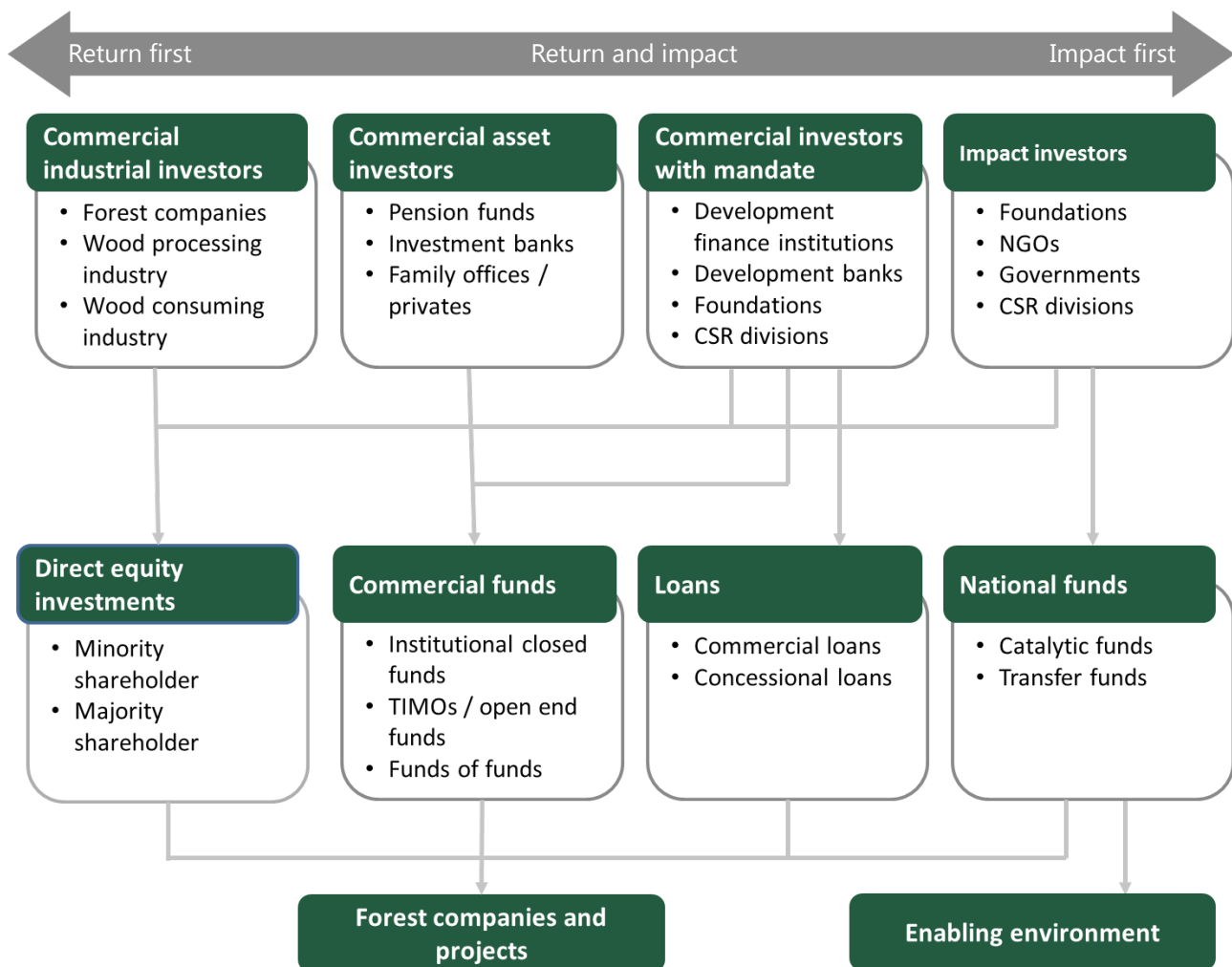
1. Commercial industrial investors driven mainly by economic parameters

Commercial industrial investors are mainly driven by economic performance. Additionally, they are directly related to the forest sector and belong to the value chain. The group includes forest management companies interested in investing in their own economic activities, companies from the timber processing industry interested in securing their timber supply, and companies from other industrial branches, such as agroindustry or the mining sector, seeking to secure the provision of timber necessary for their activities (mainly for energy uses). Commercial industrial investors are by far the most important group related to forest investments. For instance, this group owns more than 90 % of forest plantations in Brazil (Brookfield 2012). This group generally deals with direct equity investments in selected assets and seeks a majority shareholding.

Backward integration of forest production by timber industries occurs frequently with regard to forest plantations in the pulp and paper industry. In South Africa, around 50 % of plantations are held by the pulp and paper industry (own database information) whereas in Brazil this figure is around 60 % (Brookfield 2012). With regard to natural forests, commercial industrial investors come from sawmilling and veneer production, as was the case in two of our study areas, Indonesia and Republic of the Congo. This group of investors represents a huge potential for SNFM in the tropics. The identification of appropriate investment opportunities and ensuring the sus-

¹² Sustainability investments focus on environmental and social themes, environmental themes being the most prevalent. Typical examples include renewable energy, clean technology, climate change, water and forestry.

Figure 27: Potential investors and investment vehicles in the forest sector



tainability of forest management are key aspects to strengthen such investments.

2. Commercial asset investors driven mainly by economic parameters

This group of investors invests in assets mainly driven by the economic performance of the investment opportunity. However, unlike commercial industrial investors, they are not directly related to the forest sector. This group includes institutional investors holding large portfolios of several billions, mainly pension funds and investment banks, as well as family offices and private entities. They are mostly invested in funds where investments in the forest sector are common portfolio assets because they have proven to stabilize portfolios. In the case of large institutional investors, forest portfolios are often managed via Timberland Management Organizations (TIMOs).

This group focusses on investments in forest plantations in mature markets, such as North America and Australia. However, their interest in natural forests and emerging markets¹³ has been increasing lately. For instance, a few forest funds are open to natural tropical forest management (such as the Africa Sustainable Forestry Fund or the Tropical Asia Forest Fund¹⁴) and family offices and private entities have made some medi-

um-sized investments in natural forest management in Latin America (Chile and Argentina). Nevertheless, with regard to the total amount of forest investments, investments in natural forests still play an insignificant role.

Thus, for the time being this group of investors does not represent a high potential for investments in SNFM in the tropics. Some changes in investment targets (towards natural forest management in emerging markets) are being observed but it cannot be expected that changes will occur to a significant extent within the next few years, in particular among large institutional investors.

3. Commercial investors strongly influenced by political and/or ethical parameters

This group of investors is mainly driven by economic performance, but is strongly influenced by political and ethical parameters. Development finance institutions and development banks are the most relevant investors in this group. Their purpose is to promote sustainable development by providing finance and capital in sectors and countries which would otherwise not have access to it. The International Finance Corporation (IFC), the European Investment Bank (EIB) and the members of the EDFI group (European Development

¹³ New Forests (2013) recommends a maximum of 10 to 15% share of investments in emerging markets in forest asset portfolios to mitigate currency and country risks.

¹⁴ Both are private equity funds mainly financed by European Development Finance Institutions. According to statutes they can invest in natural forests. However, to our knowledge there is as yet no natural forest management project within their portfolios.

Finance Institutions) are the largest development finance institutions investing in emerging markets¹⁵. The investment vehicles used by this investor group are commercial funds, direct equity investments and loans. The ticket size is normally not below 5 million USD per investment.

For example, DEG has invested in a forest fund in the Africa Sustainable Forestry Fund (ASFF) and has equity investments in Latin America (e.g. PAYCO in Paraguay). Nevertheless, investments in natural forests are still very seldom within the portfolios of this group of investors, even though the potential for environmental and socio-economic benefits is widely recognized. This is related to the fact that there are too few business cases which meet their requirements (see Figure 28). As we have discussed in previous sections, natural forest management is often linked to land tenure issues and a lack of law enforcement, which leads to a lack of transparency and to reputational risks for investors. This situation, combined with strong public concern about the social and environmental impact of tropical forest management and with an insufficient or completely lacking track record of successful business cases, hinders these investors in opening their portfolios to SNFM in the tropics. This was confirmed by a survey conducted by Forum for the Future (2009) which revealed that sustainability issues and associated reputational risks are the main factors that prevent development finance institutions from investing in tropical natural forests¹⁶.

We believe that this group of investors represents a huge potential for SNFM in the tropics. However, only business cases which consistently follow internationally accepted environ-

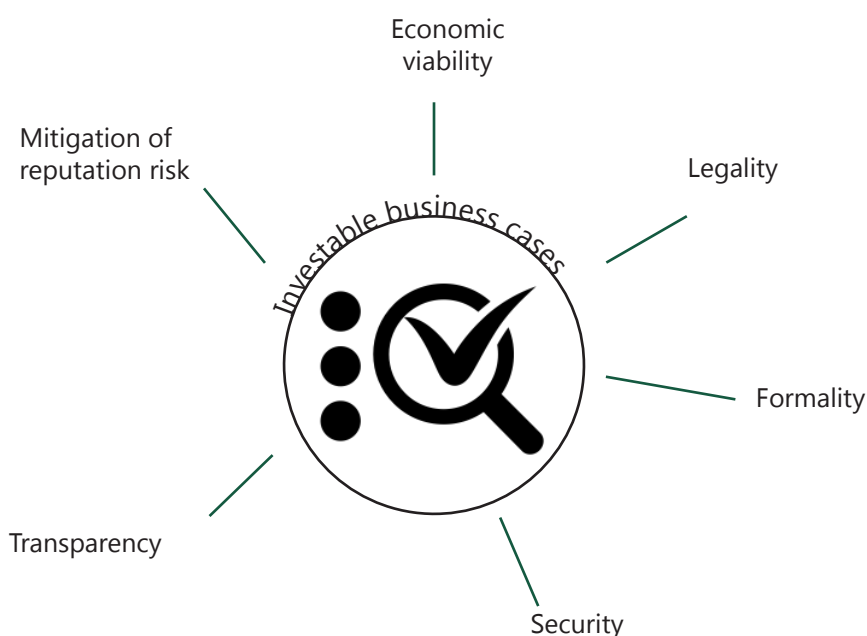
mental and social safeguards and avoid any red flags will have the chance to attract them.

4. Impact investors driven by “impact first” parameters

Unlike the other investor groups, the focus of impact investors is on environmental and socio-economic impacts. Investments are made with the intention of generating measurable, beneficial social and environmental impacts, alongside a reasonable financial return. This group includes public investors, such as governments and donor agencies, as well as NGOs and to a certain extent also foundations and CSR divisions. Impact investors mainly invest directly in projects and companies and in national forest funds¹⁷. Investment volumes from private impact investors in emerging markets were 1.4 billion USD, accumulated until 2010 (JP Morgan 2011). Impact investors can support the sustainable management of tropical forests, especially through investments in framework conditions necessary to promote investments from the private sector (enabling environment).

In summary, most investments in the forest sector focus on forest plantations in mature markets. At the moment, the most important players for SNFM in the tropics are commercial industrial investors. This group makes strategic investments to secure their raw material base. How other investor groups, particularly commercial asset investors with mandate, can be attracted to invest in SNFM will be discussed in the following section.

Figure 28: Requirements for investable business cases for development finance institutions and development banks



¹⁵ EDFI is a group of 15 bilateral investment organizations, amongst which are the CDC (United Kingdom), COFIDES (Spain), DEG (Germany), Finnfund (Finland), FMO (Netherlands), IFU (Denmark), Norfund (Norway), Proparco (France) and Swedfund (Sweden). The allocation of EDFI investment is 34% in Africa, 27% in Asia and 15% in Central and South America (Source: Dalberg 2010).

¹⁶ For instance, the European Investment Bank is not allowed to invest in natural forest management in the tropics according to internal investment criteria. Many other development finance institutions, such as the DEG or Finnfund, invest in the forest sector but not in natural forests.

¹⁷ A detailed overview of national forest funds is given in FAO (2013).

Investment opportunities for sustainable natural forest management

Overview of investment opportunities and needs

SNFM in tropical countries can be categorized into five main developmental stages (see Figure 29). These stages offer investment opportunities for the various types of investors previously introduced, which are discussed in the following section.

First, investments in the enabling environment: The first developmental stage refers to the national forest governance context and concerns the national legislation that allows forest managers to legally manage the forest. All analyzed forest companies and their country governments have already passed this stage and manage natural forests in accordance with legal requirements. Nevertheless, legal frameworks are not fully in line with sustainable forest management principles, which can hinder the implementation of SNFM and limit the performance of forest companies (e.g. legislation concerning MHD and defined intervention cycles, see also section 4). Moreover, they do not offer an appropriate enabling environment for investments, which is a prerequisite for attracting private capital. Thus, investments in the enabling environment are still necessary to support forest companies and promote investments in SNFM.

Second, investments in up-grading forest companies: The second to fourth developmental stages concern all preconditions that forest managers need to fulfill in order to achieve

the fifth stage corresponding to “real” SNFM. This includes all preconditioning legal documentation, managerial and technical capacities, and the legal execution of forest management plans for the generation of sustainable economic profits. In most cases, analyzed companies have already reached this stage, but the study revealed that there is still potential for improvement and optimization of processes and operations.

In addition to investments in the enabling environment and up-grading forest companies, two more investment opportunities exist:

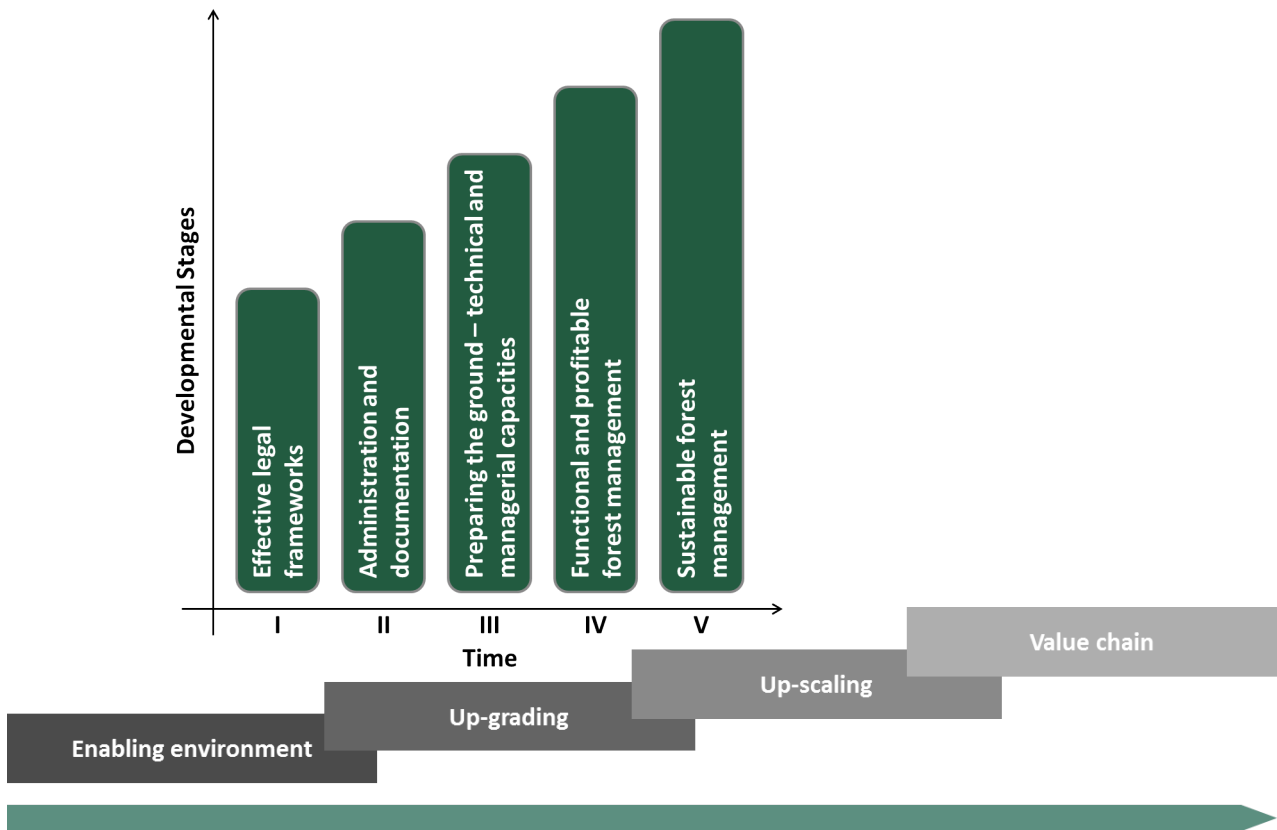
- Investments in up-scaling SNFM, which can be achieved by increasing the forest area managed by existing companies or by replicating successful business models in new areas.
- Investments in the value chain (or improvement of already integrated processing facilities) in order to enhance value creation through the inclusion of timber processing.

In the following, we analyze concrete investment options for the three investment paths of up-grading forest companies, up-scaling SNFM, and value chain integration, as well as the most suitable potential investors and vehicles. We also discuss corresponding investments in the enabling environment that are necessary to address existing barriers and to create framework conditions that facilitate and attract such investments.

Investments in up-grading forest companies

Investments can target the optimization of the forest management implemented by companies, and thus the improvement of their performance. This can include:

Figure 29: Developmental process for SNFM



- Investments in managerial capacity to improve the quality and professionalism of the management implemented. Most surveyed and visited companies demonstrated highly professional management and no particular investment needs were identified.
- Investments in the silvicultural management implemented to enhance forest productivity in the long-term. The study revealed that there is a huge potential to enhance the productivity of natural forests by applying appropriate silvicultural treatments. The application of such treatments can only be secured if the forest companies have to harvest the same forest area several times, meaning that in the future companies will only harvest what has grown between the two interventions.
- Investments in technology and machinery used in forest operations, to improve cost efficiency and reduce the impact of operations. The technology and machinery utilized in natural forest management is often outdated, which has a direct impact on the harvesting costs (the main cost driver in natural forest management).

The investment volume required to up-grade forest companies is relatively small because this kind of intervention does not necessitate abundant financial resources, in most cases the cost remains below 1 million USD. For example, the investment in liberation thinning for a company managing 5,000

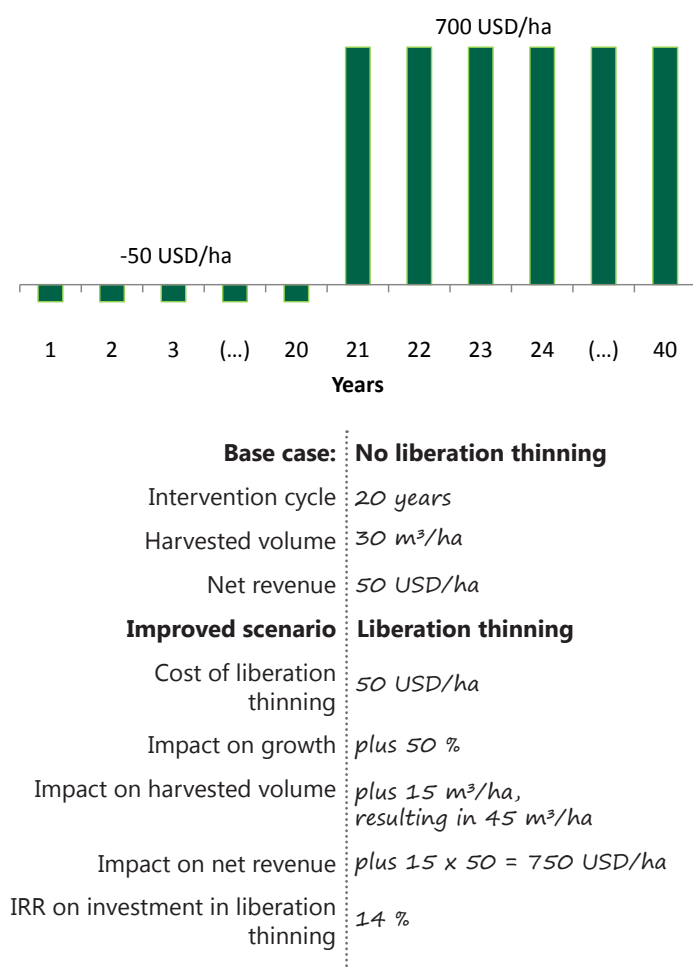
ha annually would not exceed 250,000 USD per year according to our estimations (see Figure 30). Such a small ticket size makes investments in up-grading uninteresting for large investors included in the groups of commercial asset investors and commercial investors with mandate.

Investments in up-grading can nevertheless generate attractive returns (for liberation thinning we estimate a return of 10 to 15 % through enhanced harvest rates) and have a significant impact on the performance of the company. Thus, we consider that the main target investors for such investments are forest companies themselves.

Given the low level of investments required, companies often have the resources necessary for these. If this is not the case, then impact investors may provide the necessary resources, in particular where social and environmental benefits can be obtained. For instance, the public sector can provide subsidies and concessional loans for improved silvicultural management through national forest funds (as in the case of PINFOR in Guatemala). Further accompanying investments may relate to the promotion of research and knowledge dissemination, improved land use planning and clear land tenure, and updated forest legislations.

It is important to consider that by up-grading forest companies we are providing examples of best practices and good performance, which is a key argument to demonstrate that SNFM is a viable and positive land use and business option as well as to promote investments in up-scaling SNFM.

Figure 30: Internal rate of return of liberation thinning



Note: Estimations based on our experience in SNFM in Paraguay.

Investments in up-scaling sustainable forest management

Increasing the forest area under sustainable management is the ultimate goal of the promotion of SNFM. Investments in new forest area under management can be undertaken either by establishing new forest companies or by supporting the expansion of existing companies. Both up-scaling options require a considerable amount of finance, as vast areas of forest land must be acquired (bought or leased) and production infrastructure established. In most cases, the size of the investment will be over 5 million USD. Given the huge impact potential and the size of investment required, with potential to attract large investors, the promotion of investments in up-scaling needs to be given major consideration.

At the moment, investments in establishing or expanding natural forest management companies are mainly made by commercial industrial investors, and we believe that this will continue in the future. However, given the large need of capital, commercial industrial investors will not be sufficient to turn this type of land use into a significant landscape element. The engagement of large institutional investors will then be necessary. Considering that the risk is still high and that commercial asset investors are not likely to invest significantly in natural tropical forests in the short-term, target investors mainly include commercial investors with mandate. This corresponds to development finance institutions (e.g. DEG or IFC) and development banks (e.g. KfW or the World Bank).

In order to attract this group of investors, fund investments are regarded as more realistic than direct investments in single assets, due to the lack of a successful track record. Therefore, the creation of a sustainable natural forest management fund focused exclusively on natural forests¹⁸ may be an option

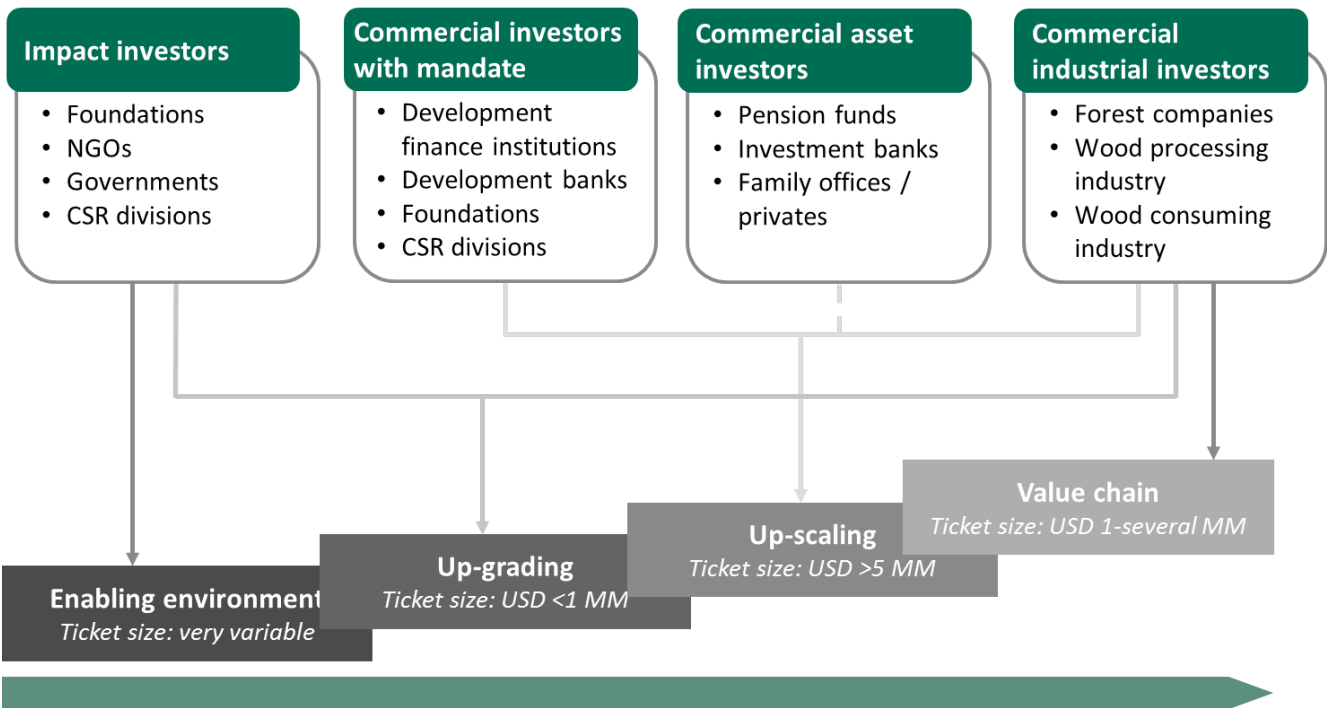
to attract this group of investors. Also, parallel investments from the public sector can contribute to overcome barriers that currently prevent such investments from happening at a significant scale. Options include supporting the identification of investable projects and project development in the initial stages, for which PPPs may be effective, and participating in financial structures that offer differentiated risk / return profiles for different types of investors¹⁹. Certification schemes ensuring SNFM can also play an important role in both the identification of appropriate projects and the mitigation of reputational risks.

Investments in value chain integration

Natural forest management companies often integrate log production and timber processing. Combining raw material production and processing facilities ensures a continuous quality and supply of raw material, improves the rate of return (if well and efficiently managed) and offers more flexibility to

react to market dynamics. Among visited forest companies, the integration of processing facilities has often already taken place or is included in their plans. The volume of value chain investments can differ significantly from the above-mentioned investment options, with values ranging from 1 million to several million USD, and internal rates of return above 15 % in most cases. This type of investment is currently already being made and is a common element of investments in capital assets by commercial banks. The challenges associated with investments in the value chain are rather related to low incentives for companies to make such investments, and to ensuring a proper planning and management that guarantees return on investment. Hence, public investments targeting long-term and secure user rights and improving the position on the market of sustainably produced timber, through the formalization of the forest sector, are important to create an enabling environment for this kind of investments. In this regard, the promotion and enforcement

Figure 31: Investment opportunities for sustainable natural forest management



¹⁸ As mentioned earlier in this section, a few funds for forest investments exist that are also open to natural forests. However, given the better performance and track record of forest plantations, resources are ultimately only allocated to planted forests.

¹⁹ This is the strategy followed by the Eco Business Fund, with resources from KfW, Conservation International and other private investors.

6 FINAL REMARKS

SNFM is an intelligent close-to-nature land use option that can contribute to the conservation of natural forests while meeting the increasing demand for timber. SNFM generates economic value, provides raw material to expanding timber markets, creates employments and rural development, and conserves biodiversity and carbon stocks. There are many good examples worldwide of certified forest companies doing an outstanding job and applying best practices. However, there are still barriers hindering an even better performance of SFNM. Main challenges identified relate to: i) addressing the informality of the forest sector and illegal logging activities, ii) enhancement of productivity through adequate silviculture, and iii) the expansion of the merchantable product portfolio of forest companies by marketing lesser known species and/or value chain integration.

To create productive and diverse landscapes, and produce timber for the growing global population, SNFM will become more and more important in the future. However, the proportion of natural forest areas that are managed sustainably is still very small. To expand substantially the area under SNFM and to address the above-mentioned challenges, investments from the public and private sector are required.

To date, private sector investments in large-scale SNFM play only a minor role for forest investments, and are almost exclusively made by commercial industrial investors directly linked to the forest sector. Main reasons why commercial asset investors and commercial investors with mandate do not invest in SNFM include the lack of a successful track record and clear investment opportunities, complex and expensive due diligence processes, relatively small ticket sizes for some investment options, and reputational risks. The enormous availability of forest area offers a large impact potential and highlights the strong need for investment in up-scaling options. The large amounts of financial resources necessary for this can only be obtained if large investors, commercial asset investors and commercial investors with mandate discover natural forests as an investment opportunity.

To achieve this, four main paths for investments are identified as necessary and should be conducted in parallel to each other:

1. **Investments in upgrading** forest companies aiming to improve their SNFM practices. The target should be to increase managerial and technical capacities, enhance productivity by implementing best practice silvicultural management,

and purchase modern technology and machinery to increase efficiency and reduce impacts. The relatively small ticket sizes (typically < 1 million USD) render such investments uninteresting for most large-scale investors. Potential investors are forest companies themselves and impact investors, in particular where clear social and environmental benefits can be obtained.

2. Enlargement of successful companies and the establishment of new ones is one of the main opportunities identified by the study. Ticket sizes of > 5 million USD make **upscaling investments** interesting to large-scale investors, but to date, it is mainly commercial industrial investors related to the forest value chain who invest in this. Such investments have a high impact potential, but require larger sums of capital and entail relatively high risks. Therefore, commercial investors with a respective mandate for such investments, e.g. financial development institutions and development banks, are the most suited investor group to engage in such upscaling activities. In the long run, such engagement can pave the way for other commercial asset investors by creating successful track records and lowering perceived risks.

3. **Investments in the value chain**, through the combination of raw material production and processing facilities, ensure a continuous quality and supply of raw material, can improve the rate of return and offer more flexibility to react to market dynamics. Ticket sizes range from below one to several million USD and internal rates of return are typically above 15 %. This kind of investment is already being made by proper financial resources of forest companies or commercial banks.

4. The legal environment underlies all aspects of SNFM. Legislative frameworks can be improved in many ways. Further efforts in formalization and enforcement are crucial to improving the performance of SNFM, as well as to lowering the political risk perceived by international investors. The financial support needed for improvement in forest governance is restricted to non-profit and impact investors and will therefore need to be covered by the public sector or NGOs. The ticket sizes of **investments in enabling environment** (such as meaningful land use planning and land tenure, adequate forest legislation, and strategic research on SNFM) vary considerably and depend on the national and local circumstances.

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