Progressing towards the implementation of sustainable forestry business models in the context of REDD+ in Viet Nam

Improved Forest Management in the context of SFM

VIỆN TÀI NGUYÊN VÀ MÔI TRƯỜNG ĐẠI HỌC HUẾ
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ABBREVIATIONS

BM	Business Model
ER-P	Emission Reduction Plan
JICA	Japan International Cooperation Agency
KfW	German development bank: *Kreditanstalt für Wiederaufbau*
FCPF	Forest Carbon Partnership Facility
FSC	Forest Stewardship Council
GHG	Green House Gas
ha	Hectare
INDC	Intended Nationally Determined Contribution
IREN	Institut of Resources and Environment
IRR	Internal Rate of Return
MARD	Ministry of Agriculture and Rural Development
NPV	Net Present Value
NRAP	National REDD+ Action Plan
ODA	Official Development Assistance
PEFC	Program for the Endorsement of Forest Certification schemes
PFMB	Protection Forest Management Board
PRAP	Provincial REDD+ Action Plan
REDD+	Reducing Emissions from Deforestation and Forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
SFC	State Forest Company
TTH	Thua Thien Hue (province)
UNFCCC	United Nations Framework Convention on Climate Change
VRO	Vietnam REDD+ Office

1 FORESTS AND FORESTRY IN VIET NAM

After dropping from a forest cover of 43% to 27% in the period from 1943 to 1990, the government of Viet Nam has taken concerted actions to stabilize forest loss and to drastically increase its forest cover again (MARD, 2007). This was achieved, i.a. by enacting policies and establishing support programs at all administrative levels to reverse forest cover loss. Viet Nam's forest sector is highly dynamic and represents an illustrative example of the underlying theory of forest transition which assumes a correlation between the (over)use of natural resources in early phases of a country's economic development, followed by reforestation and mosaic landscapes.

Major policies responsible for the progressing forest transition were the *Land Laws* of 1993 and 2003, the so-called *5-Million ha program (program 661)*, and more recently the *Forestry Development Strategy 2006–2020.* Other relevant legal instruments include laws on *Environmental Protection* (2005), on *Biodiversity* (2008), and *on Forest Protection and Development* (2004) and the 10-year forest protection and development plan for 2011-2020 (*Decision 57/QD-TTg*). Since 1995 several logging bans (in combination with reforestation policies) have had positive impacts on Vietnam's deforestation rates (Mant et al. 2013); the latest logging ban for natural forests was issued in 2014 and is still in place. The Forest Sector Development Report (MARD 2015) provides a comprehensive overview of the progress made towards achieving the forest-related policy objectives outlined by the Forestry Development Strategy 2006–2020 and the National Action Plan on Green Growth 2014–2020. This includes sustainable management of forest resources as contributions to rural development, poverty alleviation, economic growth, the conservation of biodiversity and securing the provision of vital ecosystem services.

Figure 1: Typical degraded hill near Hue reforested with Acacia
Source: UNIQUE, 2016

Today, land use change is no longer the dominant issue, except for some provinces in the Central Highlands, the Central Coast and the South East where "*clearly defined pockets of deforestation*" still exist (FCPF 2012). In contrast, forest degradation still plays a significant role, especially in and around natural forests of protected areas. Concerns remain about the low overall quality of forests (Pham et al. 2012), expressed in very low biomass stocks: An estimated 33% of Vietnam´s

forests are degraded and of poor quality (Pham et al. 2012). Much of this land has been degraded due to over-harvesting, agricultural conversion and the resulting overuse of soils. Only 8% of the forests in Vietnam are still classified as “rich and medium rich natural forests” (MARD 2015).

According to MARD (2015), forest cover still continues to increase: since 2012 from 40.7% (13.8 million ha) to 41.5% in 2014, progressing towards the national target of 44 to 45% by 2020. The forest cover increase includes all three forest categories: production, protection (for specific ecosystem services, e.g. watershed management) and special use forests (protected areas, conservation), but the main contribution are several million ha of newly established plantations (Acacia, Eucalypt and Pinus) in production forest. Currently, they cover more than 3.5 Mio. ha, with the prospect that plantations will cover more than 4.1 Mio. ha by 2020 (MARD 2015). Most of these Acacia (mangium and hybrid) plantations are managed like perennial crops in rotations between 3 and 6 years, to a large extent for wood chip production (Harwood & Nambiar 2014)— a well-established and functioning but low-profit value chain (Harwood 2011, MARD 2015) that leaves considerable economic and mitigation potentials untapped.

On the demand side Viet Nam has developed a strong and further growing processing industry which exports furniture to different markets, especially the EU and the USA. Currently, this industry has to meet its demand for sustainably and legally produced timber by importing around 80% of the sawlogs nationally processed (Phuc & Canby 2011). In order to reduce import dependency and increase the added value of this important industry, the Vietnamese Government aims at promoting large dimension timber production and sustainable forest management (SFM) in plantation forests. The current logging ban on natural forests restricts timber production, for the time being, to forest plantations. The demand for large-dimension timber for sawlogs may even further increase with the ratification of the FLEGT VPA with the EU which is scheduled for signature by the end of 2016.

1.1 REDD+

In contrast to most other developing countries and as described above, Viet Nam has successfully tackled deforestation long before REDD+ entered the agenda of domestic and international policy discussions. These efforts have been supported by many donor countries with significant official development assistance (ODA) for the land use sector (Pistorius 2015). When REDD+ emerged it was considered a new approach that complements Vietnam´s ongoing activities, and thus was welcomed early on by the Vietnamese government (Hoan & Catacutan 2014). REDD+ was perceived from the beginning as an additional building block for the national policy objectives and existing programs for the forestry sector, and that carbon sequestration is only one of many ecosystem services provided by forests.

In order to meet the requirements for REDD+, Vietnam sought bilateral and multilateral financial support for the readiness process and design of its national approach. In 2009, its request was approved by the board of the UN-REDD programme (UN-REDD 2010). Vietnam also presented in 2010 its REDD Readiness Preparation Proposal (R-PP) to the World Bank’s Forest Carbon Partnership Facility (FCPF) to obtain further support through the FCPF’s Readiness Fund (Pham et al. 2012). A National REDD+ Steering Committee was established in 2011, and in 2012 the Prime Minister of Vietnam approved the “national action program on reducing green-house gas emissions through efforts to mitigate deforestation and forest degradation, sustainable management

of forest resources, and conservation and enhancement of forest carbon stocks" during 2011-2020 (decision 799/QD-TTg, known as the National REDD+ Action Plan (NRAP). Furthermore, in 2014 the government approved decision 403/QD-TTg (National Action Plan on Green Growth 2014-2020), which links the NRAP and its proposed activities to Viet Nam's sustainable development broader agenda.

A decade has passed since REDD+ entered the international arena, and as in many other countries, full implementation is pending in Viet Nam. The challenges have been underestimated and uncertainty about funding for the different phases has further slowed the initially fast pace in advanced countries as Viet Nam. After the successful negotiations of the Paris Agreement, however, there is renewed momentum in the country, especially as the forest sector and REDD+ are a corner stone in its ambitious Intended Nationally Determined Contribution (INDC). This is also reflected in the reference emission level for REDD+ submitted to the UNFCCC in January 2016, and in the draft document for an important pilot emission reduction program in the six provinces of North Central Viet Nam has been submitted for review to the Carbon Fund (FCPF 2016). In parallel, the NRAP is being revised for the period 2016-2020, based on an in-depth stocktaking of achievements and outstanding issues. With these developments Viet Nam is a candidate country for moving towards phase III – the full implementation of REDD+, with activities that generate a measurable, reportable and verifiable performance subject to respective payments. The subsequently described models meet this requirement, are in line with Viet Nam's policy priorities and suit well the advanced stage of forestry sector in the forest transition.

1.2 Project rationale and objectives

The German International Climate Initiative (ICI), financed through the German Federal Ministry for the Environment (BMUB), is supporting the project on 'Business Models in the context of REDD+'. The project started in May 2014 and is expected to end mid-2017. During phase I the project has developed appropriate and feasible business models that meet three criteria:

1. significant mitigation potential – they avoid or sequester accountable forest sector greenhouse gas (GHG) emissions in the context of REDD+
2. implementation is largely independent of REDD+ finance; the models promote technically feasible and investable land-use alternatives
3. the models are fully in line with policy priorities and strategies for the sector, as well as driven by the interest of land owners.

In Viet Nam the project team – UNIQUE forestry and land use, Climate Focus and the Institute of Resources and Environment (IREN) of Hue University – has identified and conceptualized business models focusing on restoring the short-rotation Acacia plantations. The project strategy is to support Viet Nam in triggering a transformational change which successively replaces the increasingly less profitable Acacia wood chip business model by sustainably managed stands to produce high-value timber for sawn logs. The models demonstrate a way how Viet Nam can achieve its general policy objectives for the sector – increasing the income of forest owners and the overall economic performance of the sector, significantly enhancing carbon sequestration in the context of REDD+, reducing the import dependency for its processing industry, as well as improving the biodiversity of its production forests.

After having assessed the technical, financial and market feasibility of the business models in phase II, the team has identified pilot forest enterprises – state forest companies (SFC) and protection forest management boards (PFMB) – that wish to implement them, based on their local circumstances and priorities. Based on their commitment the project team provides different forms of technical support and advises regarding financing options for meeting the investment needs. With this, a key feature of the project is that the team not only conceptualizes the models but also provides a proof-of-concept by demonstrating the technical feasibility in pilot sites with selected and committed partner enterprises. In order to ensure political connectivity and assess options for upscaling, the subsequently described models have been presented at various occasions and discussed with government institutions (MARD, VRO), development cooperation organizations (FCPF, UN-REDD, GIZ, KfW, JICA) and other stakeholders.

Part of the approach for upscaling is facilitated by linking the project to relevant initiatives, in particular the Carbon Fund program under the FCPF. Finally, another important objective of the project is to develop a comprehensive upscaling strategy for the models throughout the country, including considerations on how to provide extension to smallholders and communes. The potential for upscaling the models is large: the area of plantations amounts to more than 3.5 Mio. ha, most of which are managed according to the baseline model. Although the models are relevant for the entire country the project has focused so far mostly on the REDD+ pilot provinces of the Carbon Fund program area. Given their relevance in the ER-P document and Provincial REDD+ Action Plans (PRAPs) the models have been referenced in the draft ER-P document and in a policy of Phu Yen province. The strategy will identify options on how to overcome technical challenges and financial constraints.

2 THE BUSINESS MODELS

Acacia hybrid is the predominant species used for plantations in Viet Nam: it is a fast-growing leguminous tree species, with its origins in Australia[1]. It has been extensively planted in the last two decades, and the trend continues. The reasons for the successful introduction and rapid expansion of Acacia are

- the simple technological requirements for production (basic silviculture),
- a well established and functioning value chain (wood chips),
- the suitability to plant even on heavily degraded soils and barren lands: Acacia with its nitrogen fixing properties significantly improves soil quality.

Figure 2: Wood chip mill in Thua Thien Hue province
Source: UNIQUE, 2016

Despite the numerous benefits of planting Acacia, there are challenges and concerns associated with the abundance and expansion of Acacia plantations in Viet Nam. First, a low and gradually declining economic performance is counterproductive for the objective to contribute to rural development and poverty alleviation – further aggravated by the increasing gap between average incomes in urban and rural areas. Secondly, short-rotation Acacia plantations are far beyond their potential regarding ecosystem services as carbon sequestration. Last but not least, enriching with native tree species and introducing SFM increases the resilience, enhances biodiversity and ensures the future provision of vital ecosystem services.

Notwithstanding the undeniable merits of Acacia for reestablishing forest cover and enabling a renewed focus on measures which increase forest quality, REDD+ and the policy objectives of the government of Viet Nam have created a window of opportunity to take the next major step

[1] The hybrid is a cross between *A. mangium* and *A. auriculiformis* ,which combines attributes from both parents.

in the forest transition – to introduce more sophisticated SFM practices and to prepare the stage for domestically produced timber for Vietnam's export-oriented furniture industry. Through the activities described, the predominant existing business model of plantation owners (producing and selling short-rotation trees for chip wood) would be replaced over a longer time period by new silvicultural and forest management approaches that focus on producing high-value timber for sawn logs. First pilot plots of both described business models have already been established in cooperation with the project in Thua Thien Hue (TTH) and Phu Yen Province.

Our models for improving the current management of short-rotation Acacia plantations promote SFM and focus on two main activities, which together are expected to significantly increase their profitability and mitigation performance:

Model 1: Improving the management to allow for increasing rotation length with the aim to shift from pulpwood /wood chips to sawlog production.

Model 2: improving the management and stepwise introduction of marketable high-value native tree species.

2.1 Acacia sawlog production

Acacia plantations grown for chip or pulpwood – as is now the case for virtually all the Acacia plantations in Viet Nam – need minimal intervention once established until harvesting, which normally takes place around 5-7 years. In contrast, growing Acacia primarily for high quality sawlogs requires specific management (silvilcultural) interventions in order to encourage fast diameter growth and also the production of high quality logs: this is done by a series of thinning and pruning operations. Ideally, the decision is made before planting, on which market is being targeted so that the various operations can be budgeted for and carried out at the critical times.

The management of fast growing tree plantations for high quality timber has been well developed in many countries and the best practices are directly relevant for Acacia in Viet Nam. The implications for Viet Nam of growing Acacia for sawlogs are as follows:

- It is important to develop alternative markets for Acacia wood, with the current over-reliance on chipwood;
- Growing high quality sawlogs will extend the rotation - and thereby the investment period – compared to chipwood: this has financial implications, which may not appeal to smaller growers;
- The key silvicultural interventions when growing sawlogs are thinning and pruning: these operations must be carried out at the correct time (which depends on the growth on a particular site);
- Growing Acacia primarily for sawlogs will still produce other products – notably chipwood, fuelwood and small poles – during thinning and from the final harvest too;
- Thinning Acacia plantations late (e.g. after 3 or 4 years) might result in an unstable crop, especially in regions vulnerable to strong winds;
- Ideally sawlogs should be grown on the most fertile sites and those sites least prone to storm damage;
- Thinning very early and heavily (e.g. to 600 trees per hectare by year 2) results in the fast growth and a more stable plantation;
- Whilst experience elsewhere can be used as a guide, it is advisable for Viet Nam to conduct its own research to establish

2.2 Native tree species sawlog production

Based on an extensive review of existing literature, several field visits, and consultation with several experts, initially we defined a set of potential native tree species to successively replace Acacia. A total of 194 native species has been identified for the greatly varying agro-ecological zones of Viet Nam but only few species meet the criteria needed to be suitable for the proposed business models. Following a site-species-market approach that matches the technical and market feasibility of business model 2, we have identified three native tree species that are particularly suitable: *Tarrietia javanica (figure 3)*, *Dipterocarpus alatus,* and *Hopea odorata*. These species have turned out to be the most promising selection for an economically profitable transition within a reasonably short period of time: next to a good growth potential, they are well adapted to the biophysical conditions in North Central Viet Nam, and produce good quality, marketable timber.

Figure 3: 14 yr. old Tarrietia javanica stand without treatment
Source: UNIQUE, 2014

Furthermore, high quality seedlings need to be available and trials focusing on planting and managing these species are needed as they would provide key lessons learned and important insight for planting (under varying stand conditions) and plantation management.

Transition for Acacia to native species management: Model 2

As many high-value native species require shade in the first years they cannot be established on cleared areas. The basic approach therefore is to open stripes in existing Acacia stands. These stripes need to be wide enough to allow sufficient light to reach the trees and to reduce the risk of suppression by the remaining Acacia. At the same time it is crucial to provide enough shade to allow for successful establishment. We propose opening twelve metre wide stripes in the existing six year old Acacia stands in a first thinning intervention. In these stripes all Acacia is extracted, reducing the total stand volume by 50%. Each stripe is then replanted with three lines of one native species (Figure 4).

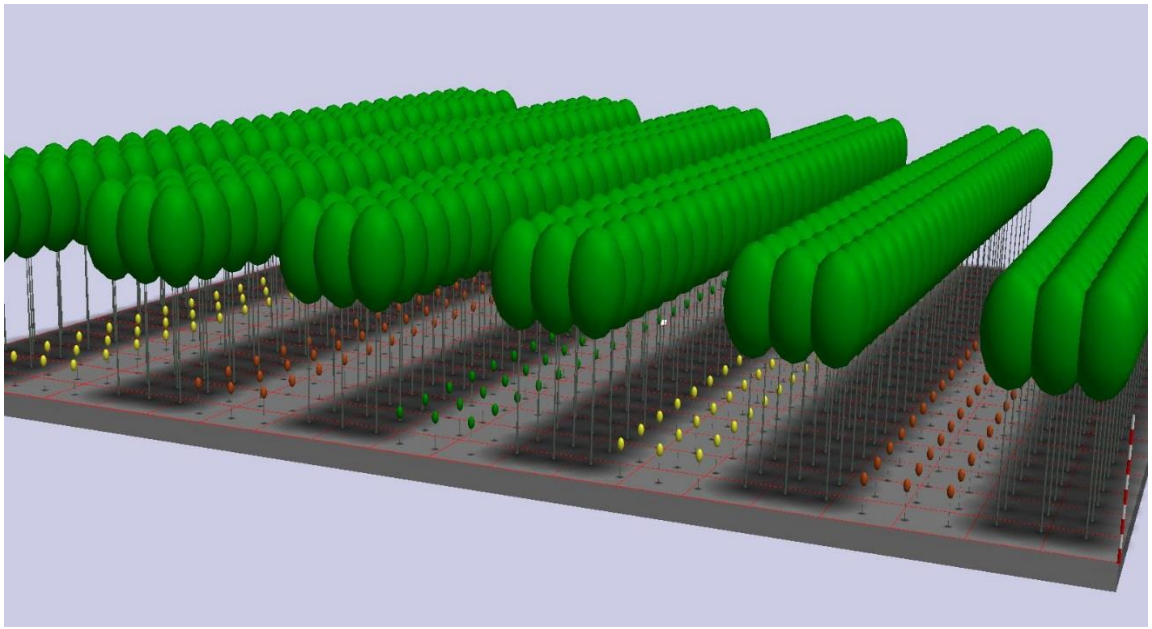

Figure 4: Year 0, stripes in Acacia stands are cleared and replanted with native species seedlings. Each color represents a different species.

Source: UNIQUE, 2016

The transition is envisioned to be implemented in Acacia plantations. The financial and production modelling assumes 6-year-old Acacia hybrid stands to be converted. At this age trees have, on average, reached a diameter which assures reasonable returns from the first extraction intervention. The income from the harvesting is likely to cover at least most of the transition investment needed. Also the more diffuse shade from larger trees is more favourable for the young native trees than shade from younger, more compact stands.

Five years after the first intervention the remaining 50% Acacia trees are felled (figure 5). Each thereby opened stripe is again replanted with three lines of one native species. By this transition regime newly planted native trees are shaded during the first years and at the same time the risk of suppression by Acacia trees is controlled.

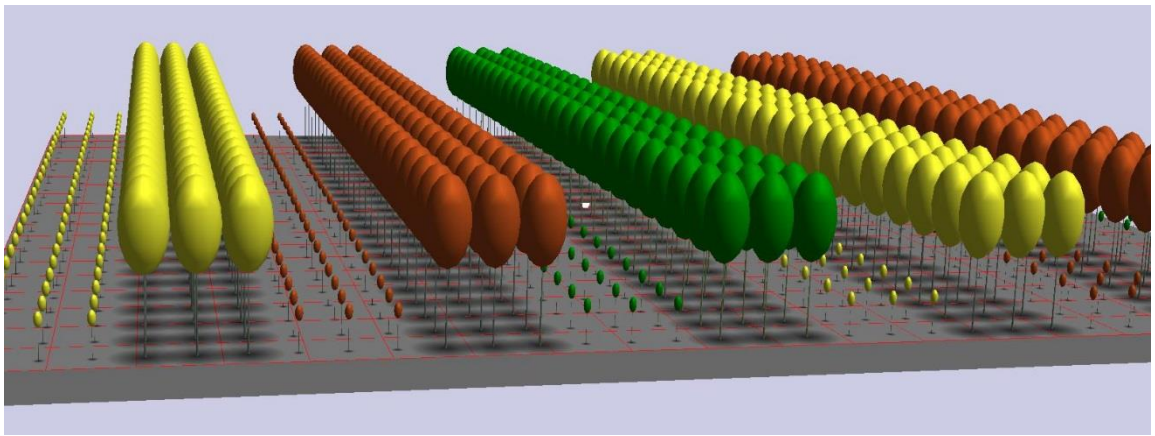

Figure 5: Year 5, older native trees act as nurse crop for newly planted native trees. Each color represents a different species.

Source: UNIQUE, 2016

Crucial for the success of the business model is an intensive and consequently implemented silvicultural regime. It includes five years of weeding, three prunings, and two thinning interventions (see Annex 1 for a detailed intervention table). The trees are harvested after a rotation period of 20 years. After harvesting the older trees, the area is replanted with the next generation of native trees (figure 6). The two-aged structure of the stand is maintained to guarantee a layer of nurse trees for newly planted trees. After the described transition period the native species sawlog regime can be implemented in perpetuity.

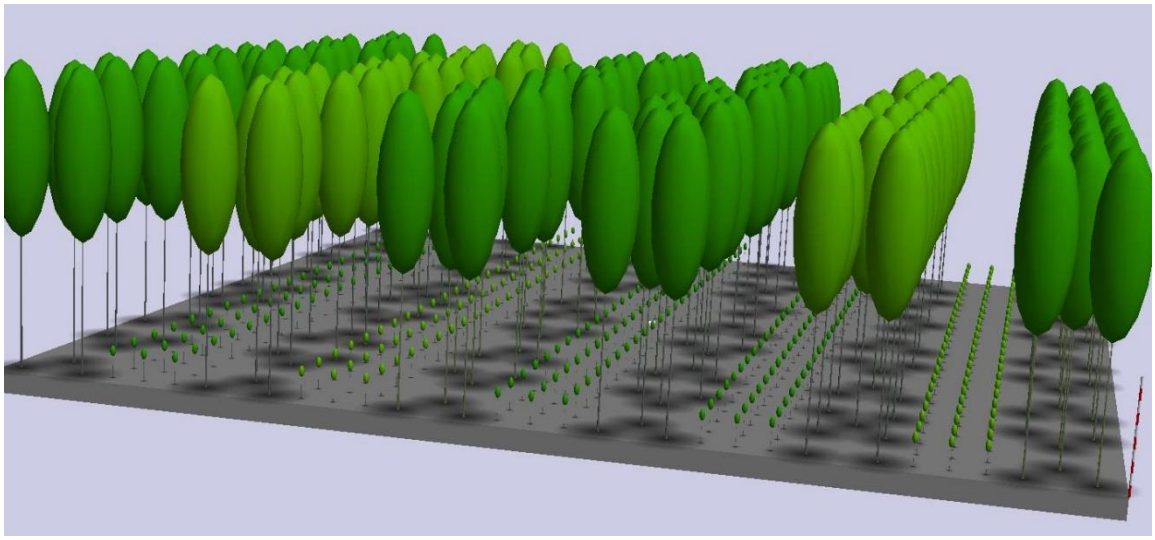

Figure 6: Year 20, 1st planted native trees has been harvested and freed area was replanted with next generation of trees.
Source: UNIQUE, 2016

The main production goal (high-value sawlogs) compensates for the higher investment costs during the rotation. Only good sites, with sufficient soil depths and situated in areas less prone to storm damage, should be selected to implement this business model.

2.3 Financial performance

A comprehensive financial modeling has been done to predict and analyze the financial performance of the business models in comparison to the business as usual scenario[2]. The net present value (NPV) at different discount rates and the internal rate of return (IRR) were selected as key financial indicators for the financial analysis. Bases for the financial modeling is a consistent period of 30 years to compare all management regimes. The results for the NPV analysis depend strongly on the underlying discount rate, which in turn depends on the cost of capital, inflation rate and investor's required short-term profits. To show the impact of differing discount rates a range from 2% to 17% is included in the analysis. It is, however, reasonable to assume a 10% discount rate.

[2] The business as usual scenario is defined as consecutive 6-year rotations of Acacia hybrid for chipwood production.

In the case of the business as usual model (6 year rotations of Acacia chip wood production) is the least profitable model (assuming 5 full rotations). The financial modeling results in an IRR of 15.6 % and an NPV of USD 1,093/ha. In case of lengthening rotation periods to 12 years of Acacia (Model 1), involving two rotations, the IRR is 16.7 % and the NPV is USD 1,912 /ha. Model 2 (native species sawlogs) achieves an IRR of 18.3 % and a NPV of USD 5,007 /ha. The results of the NPV modeling are shown in Figure 7.

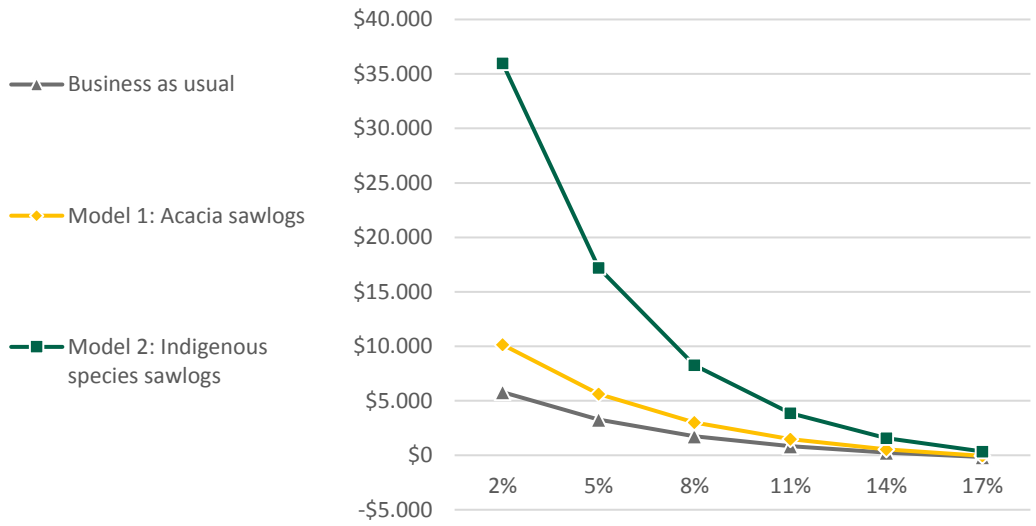

Figure 7: Net present value of business models for different discount rates (30 years)
Source: UNIQUE, 2016

2.4 Carbon sequestration

During a rotation the absolute carbon stock varies from virtually zero right after planting up to several hundred tons sequestered per hectare shortly before final harvest. In order to compare carbon levels in plantation forestry a long-term average is calculated. These long-term equilibria are increased considerably by implementing the presented business models. To calculate the net carbon benefits of a BM the long-term equilibrium of the business as usual scenario[3] is subtracted from the long-term equilibrium reached by the BMs.

Due to a very high initial planting density carbon stocks increase most rapidly in the first year for the business as usual scenario. In the medium to long-term, however, the standing wood volumes in both sawlog models reach a multiple of those generated in chipwood regimes, resulting in higher average carbon stocks. Initial growth of Acacia hybrids in Model 1 is faster than that of native species in Model 2. In the long-term, however, carbon equilibrium is greatest for Model 2. Absolute figures may vary considerably depending on the quality of a specific site, the plant material used and other factors.

[3] The business as usual scenario is defined as consecutive 6-year rotations of Acacia hybrid for chipwood production.

In a conservative sequestration modeling the business as usual scenario accumulated 61 t of carbon dioxide equivalent per hectare (tCO_2eq/ha) in long-term average. Model 1: *Acacia saw-logs* reached 117 tCO_2eq/ha and the highest carbon stocks, 146 tCO_2eq/ha, were accumulated in Model 2: *Native species sawlogs*. The respective net carbon benefits compared to the business as usual scenario are 56 tCO_2eq/ha or 92 % for Model 1 and 85 tCO_2eq/ha or 139 % for Model 2 (Figure 8).

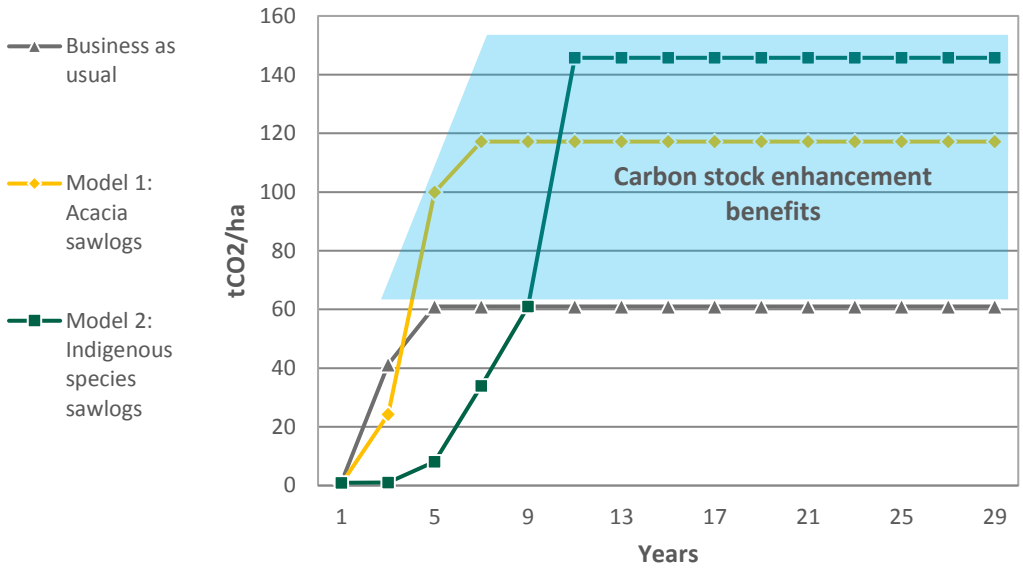

Figure 8: Long-term equilibrium carbon stocks of 1-ha models

Source: UNIQUE, 2016

3 TECHNICAL FEASIBILITY AND CHALLENGES

As UNIQUE has gained considerable insight over recent years into the forestry practices in Viet Nam, a number of significant general technical challenges have emerged. Working closely with partner enterprises of this project has helped to identify their needs for capacity building – the validation of the models has revealed entry points and success factors for the proposed transition. Effectively addressing these challenges and supporting implementing forest owners is crucial for tapping the economic and environmental benefits of the models, as sophisticated silviculture and forest management are the exception – for the time being the models exceed the silvicultural and managerial capacities of most SFCs and PFMBs. Therefore, implementing and upscaling both models will require substantive and extended support for forest owners, managers and other forest experts at province level (such as service providers and responsible agencies working in forest protection departments). In addition there are also financial and political challenges that need to be put into context and addressed at different levels. Options for these issues will be further scrutinized and published separately.

3.1 Site classification

The importance of site selection for the development of the models will be crucial for long-term success of the BMs. The introduction of native hardwood species to gradually replace the Acacia (BM 2), should only take place on the higher potential sites: important factors to take into consideration are soil depth and nutrient status, access and slope. Local forestry staff frequently mentioned the storms that the country is exposed to during the monsoon period and the damage that they can cause to plantations. Obviously, recently thinned plantations would be at high risk from such extreme weather events (figure 9).

Figure 9: Young Acacia plantation in TTH province after typhoon
Source: IREN, 2014

Of interest in this regard is the United Kingdom's experience. The UK is also a very windy country and in exposed parts, trees are frequently blown over by strong winds. The UK Forestry Commission has developed a Wind-throw Hazard Classification system to identify areas prone to damaging winds. On the high risk sites, the trees are cut before they reach certain ages (heights). It would be valuable to carry out a similar exercise in Viet Nam to identify high risk areas, where maybe the trees would only be grown on a short rotation, no thinning regime – as currently is done for chipwood production.

3.2 Seed and nursery issues

For commercial plantations, the importance of planting only high quality plant material cannot be over-emphasized. The quality of the nursery stock seen during the field visits was poor – for both the Acacia cuttings and the native seedlings. Closed plastic pots are widely used for all trees, which will cause restricted root development. The native tree seedlings are also being kept far too long in the nursery (figure 10), leading to a very 'top heavy' seedling with a very poor root structure too. A range of improvements would drastically improve the quality (and health) of the planted trees.

Figure 10: Very 'top heavy' H. odorata seedling showing a too long crown in relation to the poorly developed root

Source: UNIQUE, 2016

Another key issue noted during the field visits and training courses, was the small number of Acacia clones being used by most companies, which is a high risk strategy – especially with new pest and diseases emerging. Many of these 'new' pests and diseases are highly specific to certain clones and thus it is important to maintain a genetic diversity by planting a range of clones and ensuring a mosaic of different clones are planted in any one region. It is also important that susceptible clones are removed from production and that new clones (from trials) are regularly introduced. This entails having an applied tree breeding program in-country as well as strategic planning in terms of clonal planting.

3.3 Silviculture

In terms of silvicultural practices, key areas include initial plant density (stocking), weeding and for longer rotation crops (especially for sawlogs) – adopting appropriate thinning and pruning regimes. Growth monitoring was also identified as an important area of focus, in order to assess the impact of certain practices on yield and also to facilitate better planning of the harvest. With little experience of growing higher value tree crops over longer rotations, there is a significant need for training, clear guidelines and applied research on these issues. Thinning is especially important in order to maximize diameter growth on the selected, remaining stems.

Figure 11: Newly established Acacia plantation with a spacing close to 1m x 1m
Source: UNIQUE, 2016

3.4 Harvesting

Current harvesting practices are highly labor intensive and inefficient (figure 12). As Viet Nam's forestry sector moves towards SFM and certification, this is an area that holds significant potential for efficiency gains and will need to improve over time. Key areas will be better planning of plantation areas (especially infrastructure such as roads and bridges), low impact harvesting and health and safety of workers. This is why one of the first training courses identified by UNIQUE was to train chainsaw operators in safe working practices.

Figure 12: Typical harvesting site. In the center Acacia logs are forwarded manually.
Source: UNIQUE, 2016

3.5 Infrastructure

Harvesting and transport costs make up a very significant part of forestry's production costs. The prevailing infrastructure in Viet Nam's plantation forest areas is generally poor, with limited investment in roads and bridges. For the sector to be competitive, this is an area that needs improvement. Road planning should be an integral part of the overall Forest Management Plan for plantation areas. Good access is required not just for extracting logs at the time of harvest but also to fight fires and for staff to regularly inspect plantations. The road density and specification will be determined by the terrain, the harvesting techniques employed and the volume (and sizes) of logs being transported from the forest. There a number of excellent practical guidelines available on the planning and construction of forest roads, which could be adapted for Viet Nam's conditions.

4 TRAINING COURSES UNDERTAKEN BY UNIQUE

Since 2014, UNIQUE staff have undertaken numerous missions to Viet Nam to develop the models, to learn about local practices and needs, and to discuss options with relevant stakeholders – including local authorities and senior officials of SFCs and PFMBs. As a result piloting has started and has been included in the annual and five-year planning of enterprises. At the same time, training and capacity building needs were jointly identified with existing and prospect future partner enterprises – mostly from TTH province but also from Quang Tri and Phu Yen provinces (figure 13). Most enterprises considering implementation of the proposed models recognize the need to build technical and silvicultural capacities and in this context to adopt the principles of SFM. As a result, the first practical training courses were designed and delivered in TTH province in September 2016. Details of the training courses delivered is described in this section.

Figure 13: First training in UNIQUE's representative office in IREN / Hue University
Source: UNIQUE, 2016

4.1 Context

During visits to our partner enterprises in January and June 2016, the project staff carried out field visits and interviews with forest managers and directors. Similar in all enterprises is the current focus on short rotation chipwood production in the Acacia plantations of their production forest. The silviculture implemented in the field is limited to planting, two weeding interventions in the first two to three years and the final harvest. Almost all management staff of the

visited enterprises consists of university educated foresters, but there generally is still insufficient practical experience with more demanding silvicultural regimes. Many of the companies are interested in or already in the process of achieving forestry certification. The project's interest to promote the business models therefore met a strong interest in practical knowledge concerning SFM best practices, which is a prerequisite for certification. As a result one of the courses designed and implemented by UNIQUE and its project partners was entitled *Improved Forest Management,* being aimed at technical and top management of SFCs and PFMBs, as well as DARD representatives.

Observing harvest operations in one of the most advanced enterprises visited, as well as subsequent interviews revealed a striking need for chainsaw operator training. Current practice in Viet Nam is the virtual absence of Personal Protective Equipment (PPE). Also motor-manual harvest procedures are developed through practical experience and not by training best practice standards. Therefore a very practical courses directed at chainsaw operators was designed.

A number of reasons lead to the decision to carry out the first trainings in TTH Province: Two of the most committed partnering state forest enterprises are situated in and around Hue, the province's capital. Also the project was able to establish close relations with the provincial Forest Protection Department (FPD), which supervises and mandates much of the forestry activities on provincial level. Last but not least UNIQUE's project partner IREN and UNIQUE's Vietnam office are also based in Hue. Theory focussed class room session took place in UNIQUE's Viet Nam office at IREN headquarters. Practical training for all courses was carried out in the production forests of Thien Phong SFC and Song Huong PFMB.

4.2 Improved forest management course

Course details: This 4-day course was a mix of classroom and practical field exercises (figure 14). The overall objective was to present and discuss best practices for achieving SFM, with a focus on the transition of the current Acacia chipwood plantations to higher value end products - notably by introducing native hardwoods and also by producing high quality Acacia sawlogs. It was emphasized throughout the course that Viet Nam does not have to start from ground zero but can (and should) learn lessons from other countries - notably those with well-developed plantation sectors - for example, Brazil, South Africa and Australia. In this regard, UNIQUE was able to draw on its staff's practical experience in commercial forestry in the tropics and sub-tropics. The main classroom sessions were as follows:

- SFM in an international context;
- Acacia plantation management for sawlog production (BM 1);
- Introduction of native species into the Acacia plantations (BM 2);
- Introduction to certification.

Practical sessions focused on areas identified as important for achieving SFM and also to successfully implement the BMs described – namely, a visit to a tree nursery, pruning and thinning exercises and tree volume measurement by establishing a Permanent Sample Plot.

Figure 14: IFM course participants discussing intervention in native species BM demonstration plot

Source: UNIQUE, 2016

Feedback and lessons learned: Feedback was requested (anonymously) from the participants in order to help improve any future courses: this was very positive, with all participants rating the course as useful or very useful. A big thumbs up was also given to the balance of field and classroom work and the quality of the presentations. Some important lessons were learned from UNIQUE's viewpoint too, including identifying key areas for institutions to focus on if they are to achieve SFM and in turn certification - for example, site classification, plant quality and thinning, which were discussed earlier (Section 3). The Trainers were also able to identify other key areas which could be dealt with in future courses - notably, clonal forestry issues, fire protection and low impact logging.

4.3 Safe use of chainsaw courses

Course details: To conduct these very practical courses, UNIQUE's Trainer was an experienced chainsaw operator with a long history of working in tropical plantations. Two 5-day courses were completed, with 6 trainees on each course (the maximum to allow for close supervision). Emphasis was on safety in the field, with focus on the chainsaw operator himself, his co-workers and the general public. Following demonstrations by the Trainer himself, trainees then learned the techniques for safe tree felling and also how to maintain the chainsaws. All trainees were assessed at the end of the course and all were awarded Certificates.

Lessons learnt: There were challenges running the chainsaw courses, especially sourcing appropriate chainsaws, maintenance tools and especially the required PPE. Much of the equipment had to be imported for the courses but links with potential suppliers have since been made locally. The PPE, which is so important when operating a chainsaw, proved very hot for the operators, though this could be improved in future by running such courses during cooler months of the year! If institutions in Viet Nam are striving for SFM and certification, they will have to take health and safety issues more seriously and chainsaw operators are at the highest risk of all workers in the forest. This basic course was just the start: future training could focus on building capacity locally - both with chainsaw operation and chainsaw maintenance.

4.4 Future training

With the direction being taken by Viet Nam's commercial forest sector, notably to achieve SFM, there is a significant need for further practical training in country. The success of UNIQUE's first training courses has pointed the way to future training courses that will be needed. Priorities are seen as follows:

- The key principles behind SFM;
- Best practices for improving plantation yield and value (including establishing and managing the BMs as described earlier);
- Certification (FSC and PEFC);
- Harvest planning (incl. low impact logging, infrastructure and chainsaw training).

Many of the above training courses could be aimed at different levels, depending on the target audience. SFM, for example, is a big subject involving planning, reporting, monitoring and evaluation, each topic of which could justify a course in its own right. It will ultimately depend on demand and funding.

5 OUTLOOK

In the current and last phase of the project focuses on several activities:

- technical support for implementation of the models through direct work with and support of our partner SFCs / PFMBs,
- assessment of financing and investment options to help partner enterprises overcome potential liquidity gaps

development of a strategy for scaling and linking the models to existing programs such as the proposed Carbon Fund program for North Central Viet Nam.

First, we will continue to support our partner organizations: after a recalibration and validation of our models, we will develop silvicultural and management plans for the areas identified and committed by our partners. If financing needs occur we will help quantifying the financing needs to cover any liquidity gap for the respective forest owner. In addition, we will develop and carry out suitable trainings on the above described topics, in order to ensure that the transitions will be successful – a prerequisite for the achieving the expected economic and carbon performance.

In our partner enterprise Song Huong FPMB we have developed a 6 ha demonstration site in TTH for the model with native tree species, in which we are further refining the silvicultural approaches and use them as long-term scientific monitoring plots (Figure 15 & 16). The knowledge generated from this pilot site will serve to identify appropriate treatment alternatives for producing high-value timber. In addition, it serves as a demonstration area for interested stakeholders and forest owners from other provinces (cf. up-scaling strategy). Such demonstration sites are useful for a variety of purposes:

- identification of unexpected challenges and validation of models,
- proof-of concept for interested forest owners,
- demonstration of silvicultural techniques and training site, e.g. for weeding, pruning and thinning.

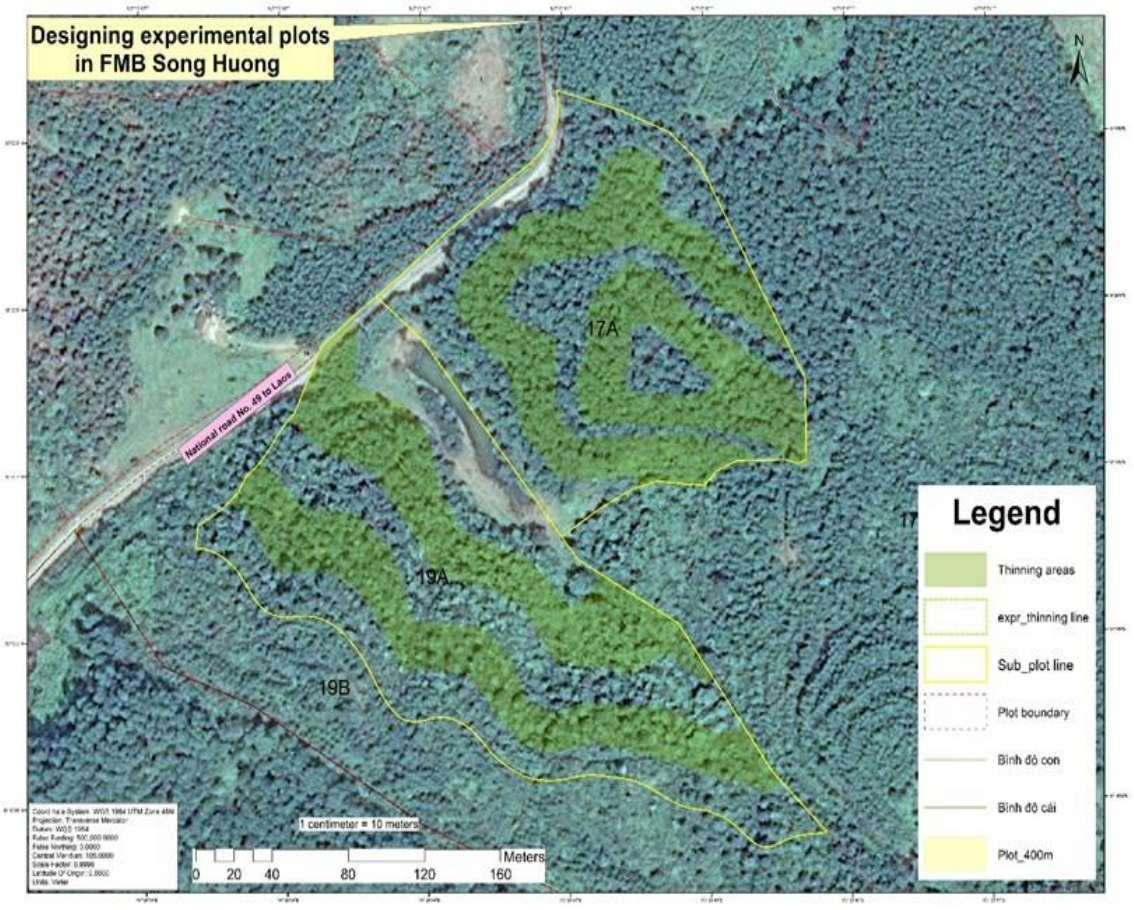

Figure 15: Native tree species demonstration site in Song Huong PFMB / TTH province
Source: IREN & UNIQUE, 2016

Subject to the availability of funding we consider to set up more of these sites in easily accessible areas to further promote the models and train on the different aspects related to implementation.

Figure 16: Demonstration site after replanting with native species
Source: UNIQUE, 2016

Secondly, we will develop a strategy for up-scaling the models – in North Central Viet Nam and beyond, including to other forest owners. In this context we will continue our efforts to cooperate with provincial governments, in particular those within the FCPF Carbon Fund area. We expect that the models will be of relevance for the Provincial REDD+ Action plans (PRAPs) that are currently under development, and will offer to provide advice and specific input to include respective policy objectives in the PRAPs, as well as to support implementation. Our demonstration area will help to convince other forest owners about the technical feasibility of this transition. Generally, the models present interesting options for private landowners and communities, too. Given their stronger dependence on Acacia income for their livelihoods and the existing capacities, strategies need to be identified on how outgrower schemes and extension services put them into the position to consider whether the models represent a viable option for their land. For the time being, the focus of our work will be on TTH province, which is particularly committed in the context of the FCPF Carbon Fund and is supported by JICA. Subject to the availability of funding the team is discussing with other committed provinces and enterprises to expand the activities – especially to Quang Tri, Quang Binh, Phu Yen and other provinces of North Central Viet Nam. The project team is currently exploring options on how to further enhance the fruitful and appreciated cooperation with JICA and DARD, e.g. by integrating the model within TTH's PRAP and providing technical support for additional forest owners.

Last but not least, we will assess options for ensuring political connectivity between the models and relevant national policies and laws, e.g. those currently under revision, such as the National REDD+ Action Plan (NRAP), the Law on Forest Protection and Development, the Biodiversity Law as well as several pieces of secondary legislation (decision, decrees and circulars) with relevance for REDD+ and the proposed business models.

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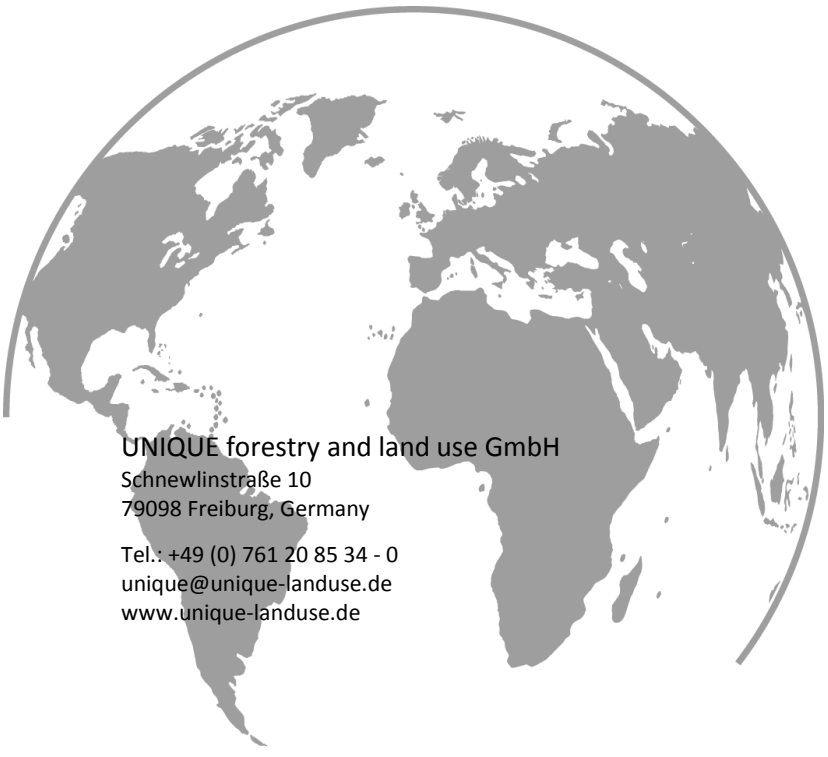
7 ANNEX

Annex 1: Model 2 silvicultural intervention table

Summary of silvicultural interventions for transition model

Year after planting	Acacia	Native trees planted 1st	Native trees planted 2nd
0	50% of area freed from Acacia in stripes	Establishment on 50% of area	
1		Biannual maintenance for first 5 yrs. after establishment 1st pruning: *access prune* approx. in yr. 4[4]	
2			
3			
4			
5	Remaining 50% of area freed from Acacia		Establishment on 50% of area
6			Biannual maintenance for first 5 yrs. after establishment 1st pruning: *access prune* approx. in yr. 4
7		Approximate timing for 1st thinning and 2nd pruning	
8			
9			
10			
11		Approximate timing for 2nd thinning and 3rd pruning	
12			Approximate timing for 1st thinning and 2nd pruning
13			
14			
15			
16			Approximate timing for 2nd thinning and 3rd pruning
17			
18			
19			
20		Final harvest and replanting	
21		Biannual maintenance for first 5 yrs. after establishment 1st pruning: *access prune* approx. in yr. 4	
22			
23			
24			
25			Final harvest and replanting

[4] Intervention year should be judged according to specific stand development rather than predetermined schedules.



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