

Adding Value and Attracting Investment to Northern Territory Timberlands

A report for



By Frank Miller

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Executive Summary

The African mahogany (AM) plantation estate in the Douglas Daly region of the Northern Territory (NT) is an example of where fundamental timberland investment drivers have been fulfilled to initiate sustained investment. Investing in, and growing a tree species, producing high value timber in a region with desired climate and within proximity of expansive markets has satisfied many hurdles of timberland investment projects. While these key elements have assisted in sustained interest in the investment, diversification through secondary income streams and exploring highest value markets for AM timber is imperative to realising optimal value of the existing resource. It was established that a preferred secondary income stream to timberland investments is carbon trading. Currently, Federal carbon trading policy does not allow plantations in the NT to be eligible for carbon credits. This is stifling new investment in timberlands for the NT.

The introduction of cattle into the plantation provides many benefits to the project: reduction of weeds, reduced fire risk and herbicide application, lower operational expenses, cashflow from agistment into otherwise long-term investment, increased nutrient cycling and the integration of two competing land uses. This integration can be refined to attract new investment to a system known as a Silvopastoral System (SPS).

As investigated throughout the author's travels, a SPS fulfills many drivers of tropical timberland investment. Demand from institutional investors for positive environmental and social impacts are also satisfied. Cashflow from initial hay operations, followed by beef production and a commercial thinning when the plantation is ten years old all contribute to generate cashflow for the high value timber investment. A SPS driven investment in the NT will provide a range of benefits to local communities, the environment, the cattle industry, and growth of high value timber.

Market identification and implementing careful segregation of the resource is also critical to optimising the resource value. Additionally, logistics and strong commercial relationships are imperative to the success of the investment. It was found that further intensified market and domestic value adding investigations will assist in adding value to the mahogany resource in the NT.

These studies have resulted in the development of a financial model and a designed SPS for the NT. It is hoped this will attract investment and growth for NT timberlands and agribusiness.

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Foreword

I am a Forester from Tasmania. I studied in New South Wales and Germany and have worked in Tasmania and the NT, mainly focussed on plantation management for fibre and high value hardwood production. I have worked for Government, publicly listed and international companies and currently run a small private management company managing plantation and agricultural assets on behalf of a United States (US)-based investment firm.

After moving from Tasmania to the NT in 2011 to manage the AM estate in the Douglas Daly region, I experienced a steep learning curve of forestry in the savannah tropics. I had to adapt to extreme climate, a pioneer project growing a species that was newly domesticated, and with no refined guidelines on growing the species. I have worked with others to refine the management of *Khaya senegalensis* in the NT.

Unlike Eucalypt and Pinus species, AM has a relatively short bole and larger crown. This characteristic, combined with the silvicultural regime that was applied in the plantations, allows mottled light to penetrate to the forest floor, permitting grasses and weeds to grow and compete for limited site resources with the trees. This meant that an intensive herbicide application regime was required to combat this fierce competition. Often multiple applications were required due to the vigorous growing conditions during the wet season which limited the efficacy of the herbicides. Considering the cost and efficacy of conventional weed control activities and risk of herbicide resistance, I sought an alternative. Cattle were introduced to the plantations in 2013, albeit with little structure and scientific evidence.

Prior to commencing my Nuffield Scholarship, I researched structured management of timber and beef production within one area, known as silvopastoralism. During my scholarship I sought to investigate silvopastoral operations and high value hardwood investments globally to establish whether the two can be combined to create attractive investments from Timberland Investment Management Organisations in northern Australia. I travelled to Michigan and Wisconsin, Florida, Costa Rica, Colombia, Paraguay, New Zealand (NZ) and China (my final destination was going to be Brazil, however this was interrupted due to COVID-19) (See Table 1) to help identify drivers in timberland investments. I focussed on both pre and post forest

gate elements of high value timber production. From my investigations I have developed an investment model for silvopastoral investments for northern Australia.

Table 1: Travel summary of my Nuffield Scholarship.

Date	Destination	Focus
March 2019	Michigan and Wisconsin	HVT management, Processing, marketing
March 2019	Florida	UGA Timberland investment Conference
March 2019	Costa Rica	HVT plantation management, harvest logistics and marketing
July 2019	Oregon	Investment drivers
September 2019	Colombia	Silvopastoral systems
September 2019	Paraguay	World Silvopastoral Congress
October 2019	China	Processing, manufacturing and markets
March 2020	New Zealand	Investment drivers, genetics

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I would like to thank the following people for without their support, my scholarship would not have been possible.

My wife Esther and daughters Mabel and Winnie. Thank you for your love and support, you pushed me into this, and I hope that we are better off for it. Words do not do my feelings justice.

Mila Bristow – I have been told most have a Nuffield “champion”, Mila was mine. She raised the opportunity four years ago and kept at me. I am glad she did.

Chris Oliver – our business has run smoothly in my absence and your commitment and vigilance has meant that I was comfortable that everything was in good hands while I was off travelling. I hope I can repay your support.

African Mahogany Australia – Michael Ramsden, Steve Hoban and Simon Penfold, thanks for your support, and for giving me the autonomy to travel and grow the business.

I would like to thank the people who generously donated their time and parted with their wealth of knowledge wherever I travelled: Larry Heathman (American Forest Management), Jonathon Wokatsch (Besse Veneers), Osvaldo Corella, Erik Kankainen, Mike Claridge, Ross Macdonald, Ian Jolly (The Rohatyn Group), Josue Benes (Mayar Limited), Bob Flynn (RISI Fast Markets), Gary Waugh (University of Melbourne), Professor Zhuo (Beijing Institute of Wood Science), Cheung Yung Kwong, Lee Quing, Victor Chong (Vicwood), Bron Christenson (The Leucaena Network), Alvaro Zapata (CIPAV), Julian Chara (CIPAV), Carlos Henandez, Enrique Jose, Juan Jose and Juan Pablo Molina (El Hatiko), Hamish Murray (Bluff Station), Glen Chen (KiwiSeng) and to Eduardo and Rodrigo Ciriello (Futuro Forestal) and Gabriel Llobet (Treevia) - the last three put in a huge amount of planning but I missed out on Brazil due to COVID-19.

Nuffield Australia for the opportunity to undertake this, and Chontell Giannini at Itravel Griffith for getting me around without a hitch on any flight.

Finally, and importantly, my investors – the Northern Territory Government (NTG) and ANZ Bank – I believe I will add interest and hopefully significant investment into the NT through to the findings of my studies. Many thanks for your support of the Nuffield program.

Abbreviations

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ACCU	Australian Carbon Credit Units
AFM	American Forest Management
AFPA	Australian Forest Products Association
AM	African Mahogany
CFI	Carbon Farming Initiative
CIPAV	Centre for Research in Sustainable Agricultural Production Systems
DBH	Diameter at Breast Height
DPIR	Department of Primary Industries and Resources (NT)
ERF	Emissions Reduction Scheme
ESG	Environment, Social and Governance
FAO	Food and Agriculture Organisation of United Nations
HBU	Highest and Best Use
HVT	High Value Timber
IRR	Internal Rate of Return
NPI	National Plantation Inventory
NT	Northern Territory
NTG	Northern Territory Government
NZ	New Zealand
SDG	Sustainable Development Goals
SED	Small End Diameter
SPS	Silvopastoral System
TIMO	Timberland Investment Management Organisation
TRG	The Rohatyn Group
US	United States

Objectives

The purpose of this study is to consider the current African mahogany plantations and investigate drivers that will add value and attract investment into northern Australian Timberlands.

1. To identify drivers of international High Value Timber (HVT) investments through a review of various HVT investments in North America, Central America, HVT products and markets in US and China and linking these to the Northern Territory landscape.
2. Identifying the foundation elements to a silvopastoral system by undertaking an Investigation of SPSs in practice in Colombia and Paraguay and assessing its feasibility within the NT landscape.
3. Determining if investors are interested in integrated timberland and agricultural investments by discussing directly with the decision makers of international timberland fund managers.
4. Developing a financial model of silvopastoral system (SPS) for potential Timberland Investment Management Organisations (TIMOs) to consider.
5. Identifying the barriers to adding value and attracting investment to Northern Territory timberlands, and listing actions required from industry, Government and fund managers.

Introduction

African mahogany (AM) (*Khaya senegalensis*) is an internationally important, high-value forest tree species that is native to the arid tropical zone of the Sahel region of Africa (Figure 1). Early trials in northern Australia demonstrated significant potential for plantation expansion (Nikles, 2007). An analysis of homo-climes, from *K. senegalensis*' natural environment, identified extensive areas of land suitable for AM plantations across northern Western Australia, Northern Territory (NT) and Queensland (Arnold et al., 2004). From this initial identification of suitability of AM, an opportunity was recognised to attract investment to grow a high value hardwood in the Douglas Daly region of the NT. This unique, well known project is now part of the \$23.7 billion turnover the Australian forest industries contribute to the Australian economy annually (AFPA, 2020).



Figure 1: African mahogany (*Khaya senegalensis*) in its natural environment (left) and in plantations in Australia

This initial planting and investment model attracted interest from forest investment managers for several reasons:

- AM was suited to the climatic characteristics of some regions of the NT;
- HVTs are in demand due to dwindling natural forest supply around the world (FAO, 2015);
- Australia has a \$2 billion trade deficit in wood products – HVTs being amongst imported wood products (AFPA, 2020);
- Suitable land was available within proximity of Asian markets; and
- HVTs typically grow in tropical regions in higher sovereign risk countries, which have higher deforestation rates, therefore a dwindling supply, as illustrated in Figure 2.

In more simple terms: *Can you grow it? And can you sell it?*

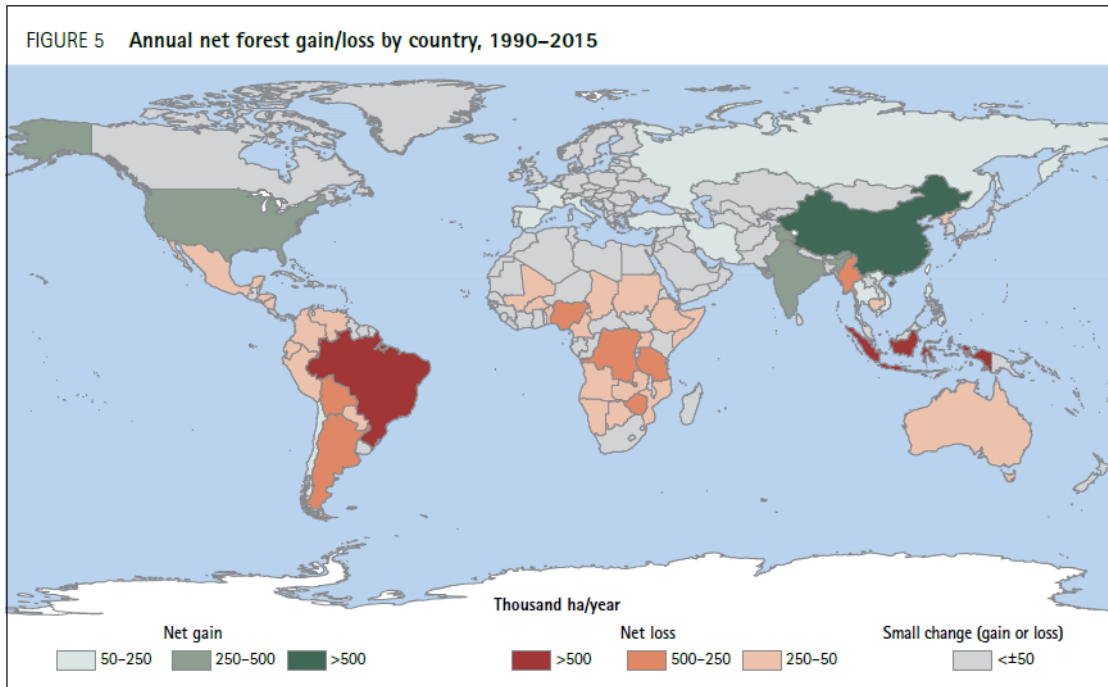


Figure 2: map illustrating higher deforestation rates in Tropical Rim countries that possess HVTs (FAO, 2015)

Whilst these key investment drivers are fulfilled within the existing investment – there are two common challenges for timberland investments:

- **Cashflow** – timberland investment requires patient capital, as cashflow can be minimal for up to 20 years. Establishing secondary and/or complimentary income streams is desirable in many timberland investments (New Forests, 2015).
- **People** - The NT is a challenging place for any type of business: extreme climate, vast distances between services, limited infrastructure and isolation are as much of a risk as they are an opportunity. There is a need to continually explore sensible options to spread risk, expand resource size and diversify without diverting significantly from the core investment.

After 12 years establishing and managing the largest AM plantation globally, key questions to realising the success of this investment are being answered: optimal silvicultural regime, required nutrition, refining products and target markets, and building a sustainable management approach based on efficient professionals and locals.

To add to this experience and knowledge, hay production commenced on a separate investment to the AM plantations that supplied hay to northern Australian cattle producers. With knowledge

of grazing within the plantations (Figure 3), growing both hay and AM has enabled consideration of integrating the three as a specific SPS investment.



Figure 3: Cattle grazing in African mahogany plantation, Northern Territory

The author sought to increase his knowledge about value adding and attracting investment. The two main focusses were as follows:

- **Pre forest gate:** investment drivers and SPSs in practice.
- **Post forest gate:** optimising value of the existing resource through better understanding of the supply chains and markets, thereby enhancing the current project's value and increasing interest for new investment.

The author attended the University of Georgia (UGA) Timberland Investment Conference in Florida and The World Silvopastoral Congress in Paraguay. This was to assess potential for executing the SPS effectively on the ground and to gauge the appetite for truly integrated timberland and agricultural investments by a suite of international investment fund managers.

HVT management and marketing was discussed in Michigan (MI), Wisconsin (WI) and Costa Rica – gaining insight into the components of high value timberland projects in different regions. A tour of HVT manufacturing and marketing was undertaken in China – this was invaluable in understanding substitute species, prices and appreciate the range of products the world's largest consumer of hardwoods produces.

The author aims to use this investigation as a foundation to continue to add value to the existing AM resource and attract investment to the NT to a land-use system that is sensible, sustainable, and profitable.

Throughout the author's travels, human resources were analysed, and it is worth noting that the NT is a place of isolation and extreme climate. It is scarcely populated and remote. However, there are abundant skills in cattle management which are an asset to consider, just like in any investment opportunity where it is only as good as the people managing it. The author considered people and business relationships in context of a SPS investment at all stages of his studies.

Chapter 1: Pre-Forest Gate

1.1 Timberland investment drivers

Forestry in Australia has been tumultuous over the past 20 years, with forest investment and ownership significantly altering rather than organically shifting due to failed Managed Investment Schemes, timber companies shutting down and Governments selling off their plantation assets (Table 2). All the while demand for plantation grown timber continued expanding in the pulp and pellet wood, composite timber products and whole-wood timber markets (FWPA, 2017). These events resulted in the emergence of both domestic and international Timberland Investment Management Organisations (TIMOs) dominating in forest acquisition transactions.

Increasing TIMO interest (which are dominantly Fund-of-Fund managers who specialise in forest asset investing), competed fiercely for acquisition of commodity plantations to capitalise on the growing construction and pulpwood markets, as outlined in Figure 4. Some TIMOs commenced exploring opportunities in less conventional forestry investments. Ribeiro (2018) highlighted AM as a great forest investment opportunity that provides high net returns (14% to 25%) – superior to most available market rates of return. High value boutique species such as teak, walnut, sandalwood and AM became some of the HVT investments globally (ABARES, 2019).

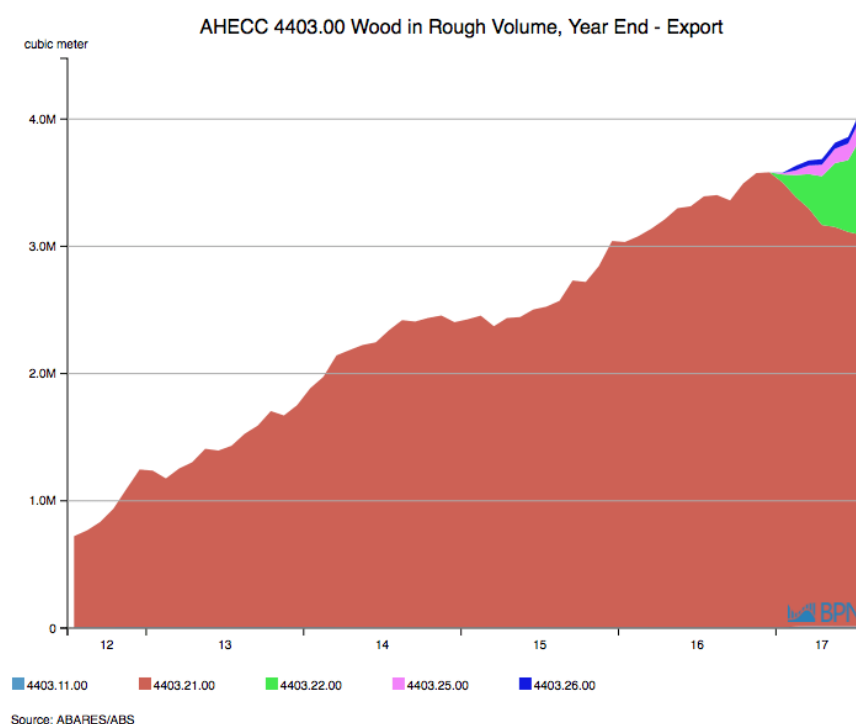


Figure 4: Illustration of massive growth (106%/annum) of construction grade softwood exports from 2012-2017
(source: FWPA)

There are many elements to consider in developing a plantation estate of international scale, particularly when the species is being domesticated and the region has limited basic infrastructure. A core emphasis on forestry investment discipline must be complemented by an understanding of higher and better use strategies, a focus on productivity, active accessing of new timber markets, and adept management of environmental and social factors (New Forests, 2015).

Table 2: Illustrating shift in forest ownership FY08-FY18 (source FWPA)

Plantation owner	2007–08 (%)	2012–13 (%)	2016–17 (%)	2017–18 (%)
Institutional investors	11	40	49	49
Governments	9	13	21	21
Farm foresters and other private owners	9	8	21	21
Managed investment schemes	34	20	5	5
Timber industry companies	37	19	4	4

Note: Joint venture plantations are not included.

Source: ABARES

Considerations throughout plantation estate establishment as outlined by Whittle *et. al* (2019), include risk management (sovereign, environmental, market), land acquisition (due diligence, negotiation, distance to market), genetic and seed stock selection, operational management (out-sourced or in-house), plantation valuation (biological growth and economic value), crop improvement (R&D and continual improvement) and the integration of the plantation into the regional landscape and other industries (social footprint, indigenous engagement and employment).

1.1.1 Infrastructure

Roads, ports, communications, supply chains and energy are core infrastructure that enhances timberland investments: ease and cost of moving products to markets; cost of running properties and ease of effective management with good communications (Donald, S., pers. comm, 2019). Some of the foundation plantation infrastructure is partially met by the existing live export industry in the NT including roads and port facilities.

Infrastructure was discussed during the author's visit to the American Forest Management (AFM) managed native HVT hardwood estate in Michigan and Wisconsin (Figure 5). The 200,000ha (approx.) native forest investment was acquired with a supply agreement to a local pulp/pallet

wood mill. Larry Heathman, Marketing Manager of AFM (pers. comm., 2019) stated that the existing infrastructure and supply agreement significantly de-risked the investment. Value adding through effective marketing of premium products from the forest resource was considered the “cream on top”. The surrounding resource and a history of forestry in the region had resulted in the establishment of ten veneer mills, six sawmills and a pulp mill within proximity to sell to. This creates healthy competition and ensures that supply and purchasing relationships remain strong.



Figure 5: Larry Heathman (Marketing Manager, AFM), Jonathon Wokatsch (Besse Products Group) and the Author at Besse Veneer Mill Mattoon, WI (March 2019)

The author also visited a teak (*Tectona grandis*) HVT estate also managed by AFM and owned by TRG in Costa Rica (Figure 6). The project had limitations due to terrain and infrastructure, roads were steep and narrow, and these challenges were offset with lower labour costs, clonal genetic stock (resulting in lower input costs), and an effective marketing agreement (Corella, O., pers. comm., 2019).



Figure 6: An example of challenging infrastructure (left), can be offset with improved genetics. Note: Teak is deciduous (Costa Rica, March 2019)

1.1.2 Impact Investing and ESG

Impact investing and Environment, Social and Governance criteria (ESG) (Figure 7) are now requisite for raising funds from almost all institutional investors for timberlands (Hourdequin, 2017). 33% and 25% of institutional investors from Europe and US respectively are sighting rejection of new investment on ESG grounds (Coller Capital, 2017).



Figure 7: Elements of ESG considerations (source: unpri.org)

ESG was central to discussions at the UGA Investment Conference in Florida. Robert Hagler, (Forest Edge), Rainer Häggblom, (Häggblom and Partners) and Steven King (Campbell Global) (pers. comm., 2019) all highlighted ongoing importance of ESG and influence of impact investors' mandates on timberland fund managers. ESG and impact investing was discussed by Markus

Grulke (Arbaro Advisors) in Asuncion at the World Silvopastoral Congress, where he said “the increased focus on impact investing is well supported by a SPS, with its efficient land use approach, integration of production systems and consideration of land and community”.

The author discussed another example of impact investing with AFM in Michigan where government policy was inter-related with impact investment principles: if access was granted in private forest estates for recreational use and enjoyment for the general public, then under both Manged Forest Law (WI), and Certified Forest Law (MI), state land tax was significantly reduced.

When the author investigated requisite factors in timberland investing in NZ, it was found that land clearing was a significant challenge. To obtain certification for plantation timbers, land must be previously cleared so the plantation is an “afforestation activity”. This currently is the key limitation in accessing land for development in the NT. Despite is expansive area, less than 1% of the NT is cleared (Woinarski, 2004). Government policy to facilitate other agricultural industries may drive the availability of suitable, previously cleared land for plantation establishment.

ESG also focusses on carbon emissions, and although carbon opportunities at present are limited in commercial, industrial plantations in Australia, Figure 8 clearly illustrates the benefits that can be obtained by investing in a SPS. Planting previously deforested land, can offset the impacts of clearing the land and grazing by ~85% (MLA, 2015).

Offsetting carbon emissions caused by grazing with the growth of plantation trees within a SPS may present an opportunity for investors and graziers and is aligned with ESG and impact investing principles, given 16% of Australia GHG are emitted from agricultural activity (Donaghy et al, 2010). This opportunity is further supported by the beef industry’s Carbon Neutral Industry target by 2030 (CN30) and can offer secondary income for beef producers by grazing in timber plantations (McNicholl, 2019).

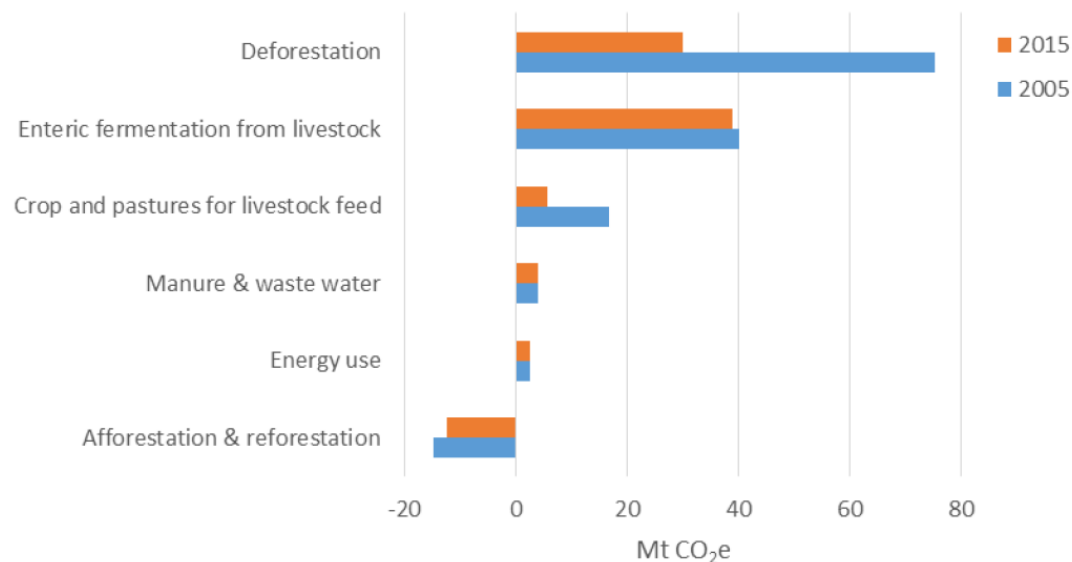


Figure 8: Carbon emissions by catalyst in Australia, 2005-2015 (MLA, 2015)

1.1.3 Diversification

Portfolio diversification¹, good risk-adjusted returns, and inflation hedging remain attractive benefits of forestry in the portfolio of existing and new timberland investors (New Forests, 2015). Diversification was discussed in all parts of the author’s travels and through one or multiple elements of all the businesses visited, diversification had been applied as a fundamental risk mitigator. TRG’s decision to diversify into agriculture was one of seizing an opportunity to broaden their investment management portfolio and presented opportunities for attractive returns through land investment, cash cropping, share-farming, and grazing. Intra-fund and project diversification have been executed in some of TRG’s investments using forestry and agricultural activity on the same property, which provides for a combination of cashflow and long-term investment (Donald, S., pers. comm., 2019).

Whilst diversification can present opportunities to reduce exposure and risk, diverting too far away from core strengths and focus can also be problematic. TRG see simple diversification, such as producing perennial and annual crops, as assisting in hedging risk. Annual crops expose annual establishment risk, but can provide greater margins, whilst perennial grass hays can easily be oversupplied (Macdonald, R., pers. comm., 2019). They also believe the combination of cattle with trees and hay is a “really nice mix”, that is sensible and optimises land-use in the NT (Jolly, I., pers. comm., 2019).

¹ Diversification sits at the very core of SPSs and will be discussed further in the Chapter 1.2.

New Forests (2015) note that growing competition for timberland investment has intensified the need for managers to diversify to obtain secondary revenues to enhance timber value (for example, see Figure 9). Revenue streams from highest and best use (HBU) sales strategies, recreational use of timberland (hunting leases, camping, etc.), sale of conservation easements, and environmental services markets are now commonplace across timberland investments. The value of carbon sequestration in forests is increasingly relied on to add value for investors. Australia is “dragging the chain” in this space as many plantation investments are not eligible to claim carbon credits under the Carbon Farming Initiative (CFI) and Emissions Reduction Fund (ERF) framework.

Carbon can present up to a 2% increase in Internal Rate of Return (IRR). The current methodology only allows plantation in National Plantation Inventory (NPI) regions to be eligible for Australian Carbon Credit Units (ACCUs). The NT is not in the NPI thus eliminating AM and Indian Sandalwood from benefitting from benefitting from this important secondary income source (Smith and Ximenes, 2019).



Figure 9: Larry Heathman of AFM standing beside a maple tree which has been tapped for syrup production, a secondary stream of income for some North American Timberland Investments

While travelling through Colombia, the author visited *Lucerna*, in the Valle de Cocoa, a diversified and vertically integrated organic food company. The property was only 222ha and produced sugar, sunflower oil, and organic milk. 17% of the property was under intensive SPS which incorporated *Leucaena* for dairy cows, 11% low intensity SPS, and 68% high yielding organic sugar cane. Manager A philosophy of “by dividing we multiply” was adopted on *Lucerna*, this diversification had enabled

over-farmed areas to recover and become productive and profitable under this management (Jose Jimenez, pers comm., 2019).

In the Valle de Cocoa, the Molina family business operating on El Hatiko Ranch applied diversification of sugar, cattle, timber, and ecosystem services (applied through the National Ecosystem Service Payment scheme of Colombia). These have resulted in increased production on less land. Soil, water, and forest community health had been monitored since the family transitioned to organic farming. through monitoring environmental improvement on their farm, increased water availability through increased soil organic matter was realised, resulting in higher productivity across the farm (Molina, E.J., pers comm, 2019). The farm was organically certified, realising a 100% premium on certified products compared to non-certified products. Organic certification on El Hatiko was simply a by-product and not an objective of the farming system that had been implemented (Molina, J.J., pers. comm., 2019).

1.1.4 Integration

Integration in farming and forestry is a farming system with simultaneous activities involving crop and animal. The main purpose of integrated farming is so that the farming components support one another; hence, reducing external inputs (Files and Smith, 2001).

Through discussion with Alvaro Zapata from the Centre for Research in Sustainable Agricultural Production Systems (CIPAV) in Colombia, it is evident that SPSs are a sustainable, sensible farm management system when a landowner wants to diversify through integration.

KiwiSeng is a company that farms ginseng within plantations of radiata pine in Rotorua, NZ. Wild ginseng is grown under a forest canopy, and managed pine forests aged from 10 to 28 years are proving to be an ideal environment (Figure 10). Because KiwiSeng's ginseng has been grown naturally for over 15 years with no chemical inputs and little human intervention, it can be classified as wild grown ginseng which fetches a market premium. There is a huge opportunity through integration to supply China and Korea with organically certified ginseng, which grows at the same latitude south as wild ginseng grows in northern China and North Korea. NZ also has an active Emissions Trading Scheme, which for KiwiSeng's radiata pine, could provide added income. With both the carbon credits and the ginseng, \$80,000/ha could be earned within 8-15 years through integration (Chen, G., pers. comm., 2019).



Figure 10: Glen Chen, Director, KiwiSeng (left) and ginseng growing in pine plantation in NZ (right), show promise as a profitable form of integration in plantations

1.1.4.1 Integration: Silvopastoral systems

Integration not only diversifies, but increases productivity through an array of symbiotic interactions, for example growing a legume crop within plantations is likely to benefit tree growth from nitrogen fixation benefits (Congdon and Addison, 2003). The development of a refined silvopastoral system in the NT has been absent due to the immaturity of plantation activities more broadly in the region.

Research undertaken in wet and seasonally dry tropics in Australia has proven up to 16 useful legume species persist under plantation canopy (Condong and Addison, 2003). This was witnessed in Colombia on all silvopastoral properties visited where both legumes (mainly *Leucaena spp.*) and grasses persisted, providing quality forage for cattle.

During different times of year, silvicultural stage, and various site types, AM allows a significantly higher amount of light to the forest floor compared to conventional plantation species such as *Eucalyptus* and *Pinus spp.* Due to the physiology of *Khaya* (open branching, semi deciduous in dry season), and with a focus on integrating grazing – an argument exists for lower stocking rates to successfully execute this system².

² This is reflected in the proposed SPS for the NT in 1.2.4 of this report.

1.1.5 People

Every business visited acknowledged the importance of local people in their business model and were sensitive to regional community culture. This was evident while visiting the AFM teak plantation estate in Costa Rica and was discussed at in depth at the UGA Timberland Investment Conference in Florida. It was stated repeatedly that human capital was one of the most limiting factors in effectively investing in timberlands projects (UGA, 2019). Local culture can be limiting, as experienced in the Costa Rican project, where labour crews would not work beyond their village region due to the “unknown”. This meant multiple works crews were required to be trained to undertake works that one crew could complete if they were willing to travel.

People and human resource management was a core focus at Besse Veneers in Wisconsin where General Manager, Jonathon Wokatsch (pers. comm., 2019), referred to people as being the most important element of the business, “Everything else is secondary if you haven’t got people to realise value”. Being customer focussed, Wokatsch implemented a culture of “Effective employees treat their peers as their most important customer”. An employee of each area of production spends time in other areas to understand the challenges of their colleagues so that they treat each subsequent area as a customer. Touching on regional skills shortages, Jonathon said that ground level employees are important, although inherently there will be a higher turnover of those workers than management staff. “It is important to understand that turnover will always occur, it is unhealthy turnover you need to be wary of” Wokatsch emphasised.

Wokatsch also believed that strong personal relationships and open communication had built his business to avoid a common problem for larger log processing businesses: “the marketing guys giving value added product away just to get a sale and the procurement guys paying too much just to keep logs up to the mill”.

1.1.6 Liquidity

The liquidity of an investment influences its attractiveness. According to Seth Palmer, Principal, PGIM Real Estate Finance, “When I look to invest in a project I want to know who and how many people will be willing to purchase my investment when I want or I need to sell.” Forest investments are traded commodities, and the combination of many of the discussed drivers in this report

influence the liquidity of the investment. This notion is also supported by implementing HBU strategies outlined by New Forests (2017). TRG also consider continual maintenance and sensible expenditure on non-plantation assets on properties was also a way of displaying good management and maintain property appeal (Donald, S., pers. comm., 2019).

1.2 Silvopastoral Systems

1.2.1 Silvopastoral System Introduction

A Silvopastoral System is a land management approach that integrate the growing of trees and forage, and the grazing of domesticated animals in a mutually beneficial way (Wilson and Lovell, 2016). In the context of this study, a SPS combines the production of HVTs and hay in the early stages of the plantation, followed by managed grazing for beef production. However, widespread acceptance of SPSs have been hindered by the notion that the two cannot be productive as an enduring, integrated system (Congdon and Addison, 2003).

There are many benefits of a SPS, these include increased and diversified income and increased cashflow, optimising land-use, soil stabilisation, and the potential for higher plantation growth and yields through better weed control, nutrient cycling and nitrogen fixing (Congdon and Addison, 2003). SPSs require the management of their components in such a way that the trees, shrubs, fodder and soil, in addition to animal grazing, are sustainable and enduring. The importance of fodder trees and shrubs is that they serve a dual purpose. Through the maintenance of a continuous vegetation cover, they contribute to exceptional provision of animal welfare (through animal comfort in hot climates providing shade and adequate feed), bring tangible benefits in animal production, and improved fertility, biodiversity and sustainability (Donaghy, 2010). These systems are also an option for reversing grassland degradation processes by increasing physical soil protection and contributing to fertility recovery through the inclusion of nitrogen-fixing leguminous species and deeper rooting trees that recycle nutrients through the depth they reach (Rivera, J. *et al*, 2019).

1.2.2 Current system in the Northern Territory

AM has been grown in the NT at industrial scale for the past 12 years, with an intended crop rotation age of 20-25 years. The targeted destination for this high value hardwood will be to furniture, flooring and veneer manufacturers in China and South East Asia. It is the largest

plantation of is kind globally and is now nearing the commencement of the first commercial harvesting operations.

Grazing cattle on agistment throughout the AM estate was first introduced in 2011. It has organically developed into a significant program whereby four separate agistees occupy six separate properties grazing up to 5,000 head at any one time. This has delivered significant mutual benefits to the plantations and the cattle:

- weed and grass reduction throughout the plantation
- fuel reduction to alleviate fire risk
- reduction of herbicide use within the plantations
- increased nutrient cycling within plantations
- decreased soil erosion through maintaining ground cover
- mahogany coppice: supply of high-quality feed
- increased positive community interactions between corporate plantation growers and individual and corporate members of the NT cattle industry
- provision of feed to some graziers that have limited options on their own properties
- strategically well located to supply export markets being within 200km of the Darwin port
- generation of income through agistment fees
- increased investment of grazing infrastructure and property value
- reduction in operational expenditure and application of herbicide and fuel reduction burning

The positive outcomes that have been achieved through this program have attracted interest from many potential investors and researchers.

Whilst the benefits of the current system have been significant, by its very nature the system cannot be referred to as a SPS. A SPS is a system that creates a symbiotic relationship by integrating the growth of trees for wood and non-wood products concurrently with fodder production and cattle by *design* (Chara, J., pers. comm., 2019). The AM plantations in the Douglas Daly region in the NT have had grazing introduced to them as a sensible mechanism to reduce herbicide application and control competitive understorey. As outlined in Figure 11, forage/hay production is relative to the proximity of trees and direction of prevailing wind. This highlights the importance of understanding local conditions when designing the system.

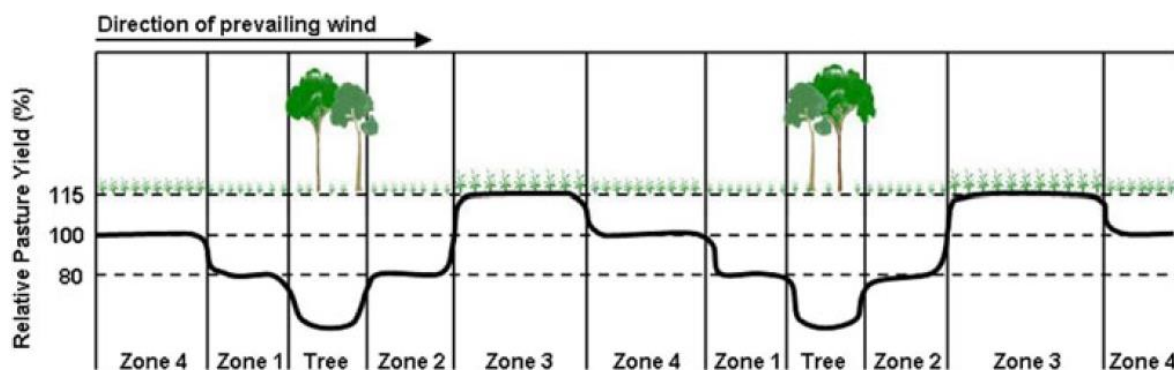


Figure 11: Forage production relative to zone from trees (Donaghy *et. al*, 2010)

1.2.3 Case Study – Dry tropics of Colombia

Inspecting SPS with CIPAV in Colombia was a highlight of the scholarship. The means in which SPSs are executed in Colombia has a dominant environmental services focus – with tangible commercial benefits arising from applying good SPS principals.

Valledupar is a region in northern Colombia which mirrored NT climate “dry savannah tropics”: 1,000mm rainfall, with 2,000mm evaporation. The author visited a farm where cotton was the primary crop. Following a collapse in the cotton market in the 1980s a significant proportion of the land was left degraded, through overuse of chemicals and poor soil conservation practices. The author visited 'Guadalajara', a 500ha property located approximately two hours northwest of Valledupar. The owner had engaged with CIPAV to advise on and supervise the establishment of a SPS as a land management system that could address productivity issues he had inherited with the property (Figure 12). By rehabilitating the land with a SPS, the owner realised he could build a commercially feasible farm through grazing and timber production (Figure 13). The system will be replicated on the landowners’ many other properties (an influential beef producer in Colombia). The system was developed by establishing *Eucalyptus camaldulensis* in 5m rows with 2m within row spacing for 5 rows (25m), 2m spaced rows x 10cm spaced Leucaena seeds, with panic grass sown within the eucalypts. As illustrated in Figure 14.



Figure 12: Nearby degraded land at 'Guadalajara', Valledupar region, Colombia



Figure 13: SPS with commercial trees: Colombia – see Figure 14 for more detail

Cattle were introduced onto the Leucaena six months after planting, with the trees protected by a hotwire for the first 12 months (once the trees had reached 6-7m in height!). This system enabled good cattle performance (average daily gain of 2.5kg/ha/day), feed variation (panick and Leucaena), shelter from the trees and timber crop at six years.

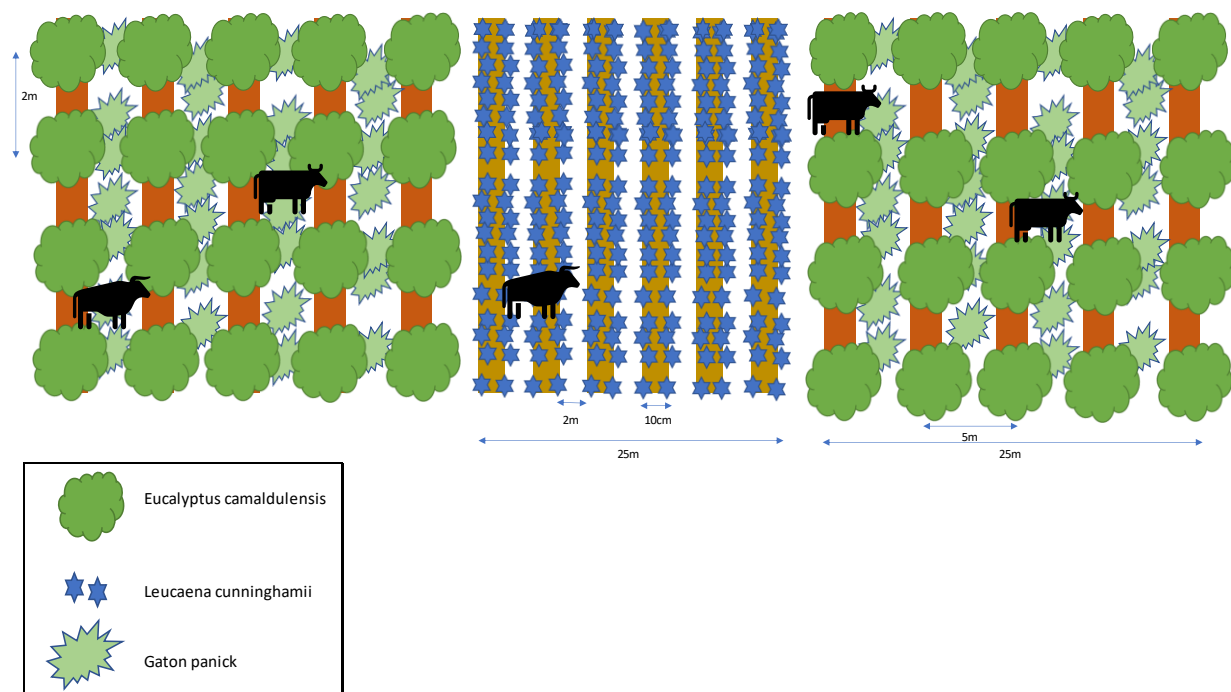


Figure 14: SPS applied on "Guadalajara"

There were clear environmental benefits to this system: soil stabilisation, nil erosion, nil herbicide use, diversity of plants within the planted system, and the surrounding land was still suffering from the legacy of poor farming practices of the past, as illustrated in Figure 12. There were however reservations towards the benefit of *E. camaldulensis*. The value of this species in the region was low due to limited market opportunities for pulp or whole wood. It was clear whilst investigating this system that HVTs would be able to offer significant value to this SPS, otherwise the system worked well.

The SPS relies on intensified rotational grazing of small paddocks (only 2ha), 1-3-day grazing within paddock and spell paddock for 45 days. It was easy to monitor recovery and growth of all paddocks, but the system does rely on intensified labour, a function of cheap labour in developing countries.

Other limitations of this system in this region were centred around human resource availability. Education and communication were raised as limits in executing refined grazing, CIPAV professional Leonardo Manzano supervised the establishment of this system and continues to work with farm managers to optimise the system's performance. This issue is addressed with the depth and culture of beef production in the NT. As will be discussed in the envisaged system for the NT, the system will not rely on small grazing cell (~2ha) movement of cattle, rather an intensified version of the existing grazing system in the NT.

1.2.4 The proposed SPS for the Northern Territory

After investigating various possibilities, a system to be developed and refined in the NT will remain focused on HVT production. As explained further in 2.4.1 below, increasing piece size is critical to increasing value for HVT plantations. To undertake this, lower stocking of plantations needs to be applied. This lower stocking inherently offers the opportunity to impose a SPS due to greater area being vacant between trees in the early stages of the plantation as illustrated in Figures 15-17. When inputs to this design and approach were modelled, a nominal IRR using this SPS is achievable (Figure 18).

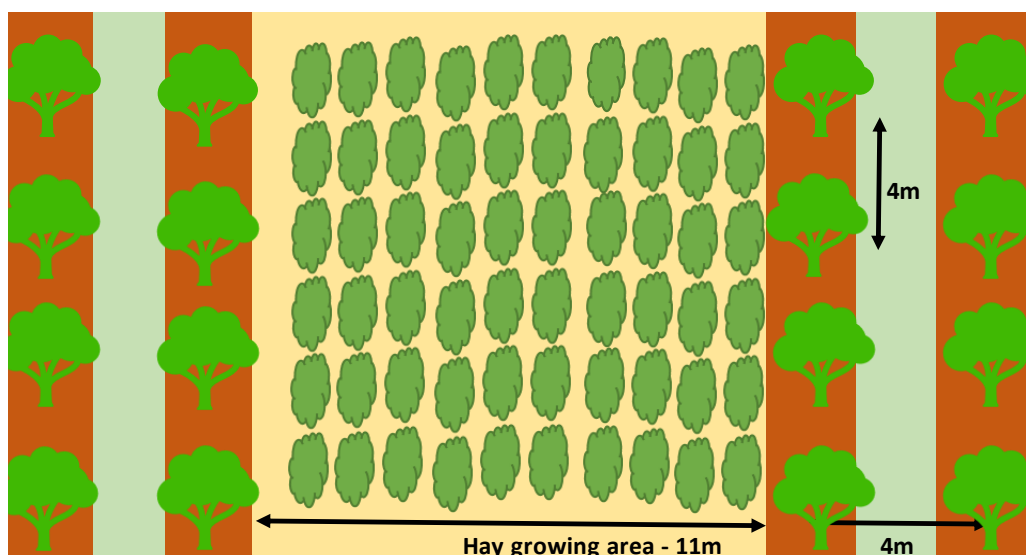


Figure 15: Layout of modelled SPS for khaya/hay/cattle, years 0-5, khaya stocking 400sph

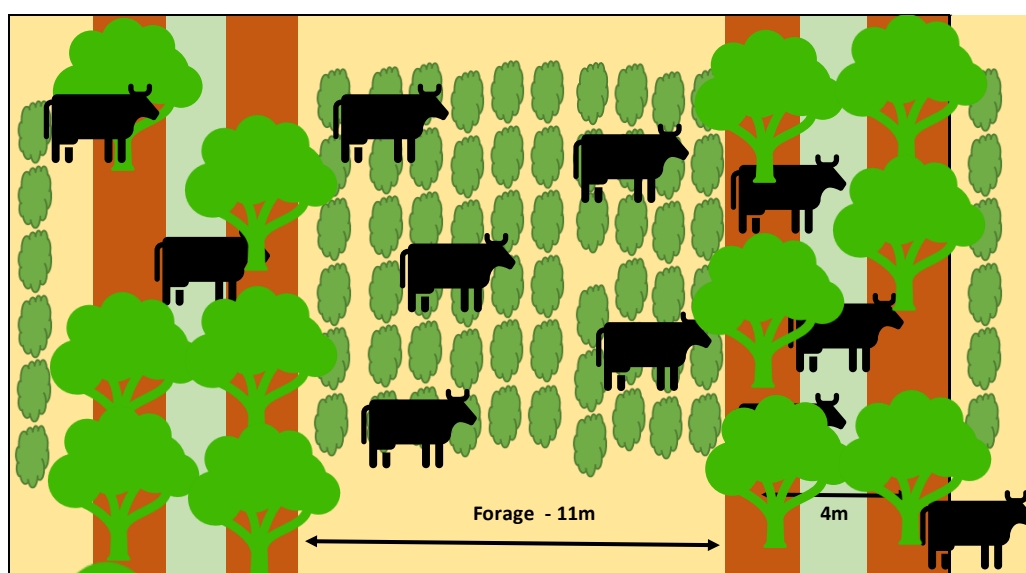


Figure 16: Layout of SPS from years 6-10, note reduction of stocking to 300sph

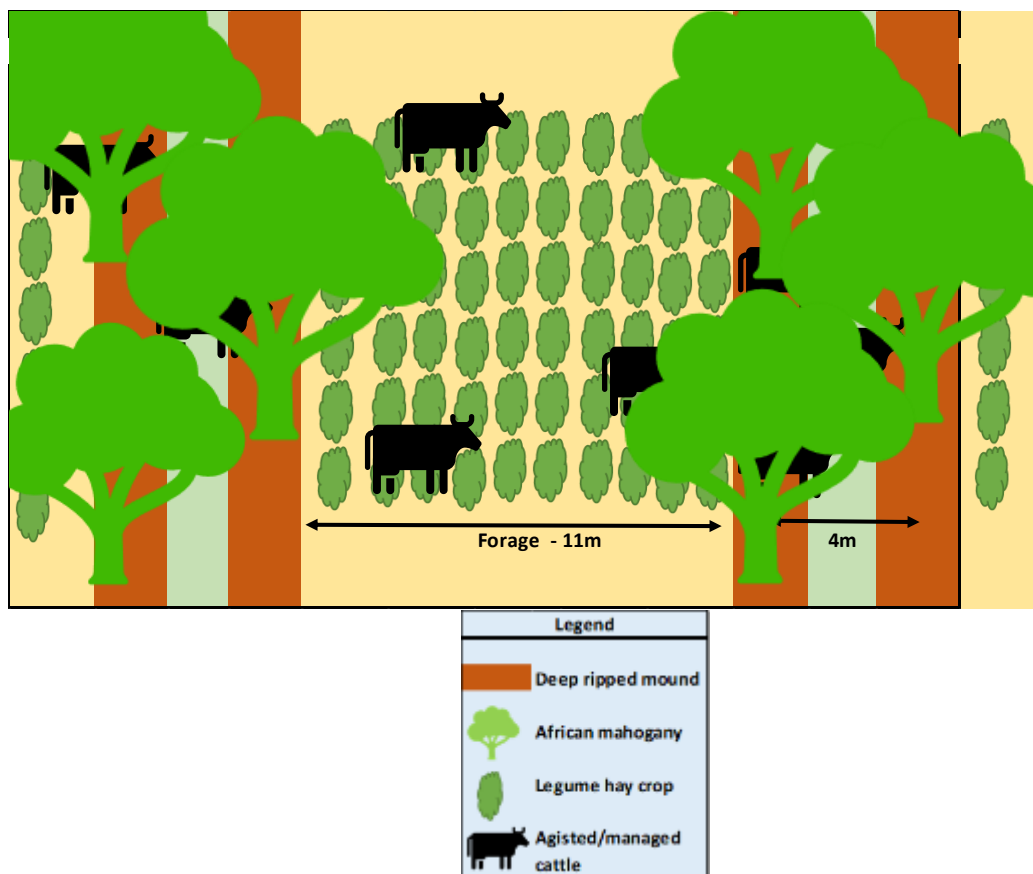


Figure 17: Plantation layout following a commercial thin at age 10, from 300-150sph. This will; remain in-situ until clearfall harvest

Silvopastoral Project Model																
1	Inflation	2%	Cattle													
2	Rotation	22 years	Agistment													
3	MAI	m ³														
4	Tax	30%														
5	NPA	2500														
6	Year		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
7	Year no.		0	1	2	3	4	5	6	7	8	9	10	11	12	13
8	Land															
9	Khaya Capex															
10	Property Opex															
11	Hay Opex															
12	Hay Revenue (dryland)															
13	Cattle															
14	Agistment															
15	Pivot															
16	Stumpage (khaya)															
17	EBT, pre-fees, real		\$ (5,345)	\$ 144	\$ 219	\$ (361)	\$ 224	\$ (147)	\$ (324)	\$ (64)	\$ (64)	\$ 176	\$ (64)	\$ (64)	\$ (64)	\$ (64)
18	EBT, pre-fees, nominal		\$ (5,345)	\$ 147	\$ 228	\$ (383)	\$ 242	\$ (163)	\$ (365)	\$ (74)	\$ (75)	\$ 210	\$ (78)	\$ (80)	\$ (81)	\$ (81)
19	IRR real	9.0%														
20	IRR nominal	11.1%														

Figure 18: SPS financial model developed for Northern Territory (sensitive data hidden)

Chapter 2: Post Forest Gate

2.1 Markets

The primary driver in timberland investment is market demand for timber (New Forests, 2015). There is increasing market driven regulations and traceability mechanisms being placed on tropical timber supply and manufacturing. These include timber certification and tracking, initiation of public procurement policy, forest law enforcement and illegal trade (Li, 2018). This presents excellent opportunities for sustainably grown, certified, scarce, and unique HVTs in Australia (Van Rensburg and Daian, 2020).

Coupled with Asian market demand and consumer trends, proximity to these markets is critical (Van Rensburg, 2017) and was a primary consideration when deliberating the HVT investment opportunity in NT (Figure 19).

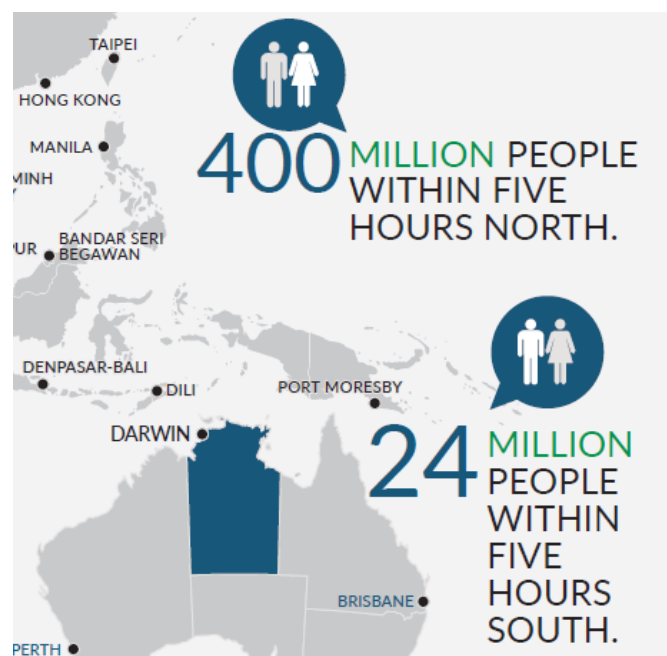


Figure 19: Market proximity of NT HVT resource (NTG, 2017)

During a week spent in China, the author visited five timber manufacturing plants (flooring, furniture and moulding) to undertake preliminary intel gathering on market trends, manufacturing specifications, substitute species and quality standards and investigate opportunities for the Australian AM plantation resource. Plant and showroom tours followed most visits and the quality of products and firms visited was excellent.

Market demand in China at present is strong (van Rensburg and Daian, 2020). Even though the housing market is slowing, the push for an urbanised population is still prevalent. In China, parents often purchase the first home for their children. Homes are purchased free of most standard fixtures (kitchens, architraves, doors, flooring, etc.), so these are selected and fitted once the apartment is purchased. This influences tastes (as the parents have a say in how the apartment is fitted out), and parents are eager to display status through HVT flooring and furniture (Figure 20).

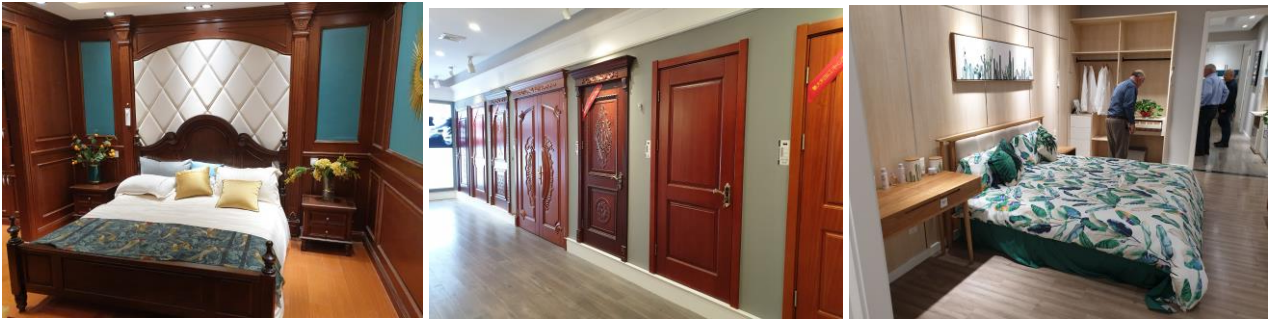


Figure 20: China has many display centres offering products to suit all tastes and budgets for the domestic market

Highest and best use (HBU) strategies (not only for land assets, but products too) are critical for optimal returns for timberland investments (Gretzinger, S., pers. comm., 2019). Markets can be built through creative promotion of products, not simply through conventional channels (Figure 21).



Figure 21: Novel value adding (pressurised staining) and promotion has optimised value of this pine product for GreenWood Resources LLC

Opportunities for AM exists for flooring, and short pieces of timber are acceptable for this application. The author observed that there were opportunities for premium logs to be processed for furniture with sizes >35cm small end diameter (SED). This is amenable to the shorter log lengths that AM produces (Figure 22).



Figure 22: Example of African mahogany timber (left photos) and Sapele (right), an alternative species

While China continues to rely on Papua New Guinea and Africa for much of its premium timber, there will continue to be changes in species mix as supplies of various species are exhausted (Li, 2018 and van Rensburg 2017). This presents a continued strong opportunity for the AM resource in northern Australia (van Rensburg and Daian, 2020).

2.2 Logistics

Harvesting, log utilisation, transport, segregation, fumigation, container loading and/or ship loading were all critical links in the supply chain that can impact on margins and returns (Josue Brenes, J., pers. comm., 2019). It was discussed throughout the author's travels that log sales and marketing and related logistics can be approached with many different models:

- Stump log sales
- Forest gate logs sales
- Wharf log sales (Free on board)
- Destination wharf sales (cost, insurance, freight)
- Value added timber and fibre products



Figure 23: Example of small local supply chain logistics in Costa Rica.

The ease by which any of the links in the supply chain can be undertaken inherently impacts on price (combined with market demand). Understanding destination market appetite also impacts freight pricing. An understanding of alternative freight channels (i.e. fruit supply), can assist in ensuring opportunities are not missed. This may be in the form of utilising existing supply chains if there is availability of freight space present due to changing market conditions and supply. Another important strategy to employ was ensuring access to multiple ports. Trade deals are fluid in India and having a “plan B” was always wise as conditions frequently change (Brenes, J., pers. comm., 2019).

2.3 Segregation

Segregation and utilisation are critical to a forest resource’s value (Ribeiro, A *et al*, 2018). Technology and skills play a significant role in ensuring highest and best use of timber resources (Heathman, L., pers comm., 2019). An example of this was identifying maple logs displaying the “birds eye” feature from the AFM MI/WI hardwood estate that were segregated and placed on display at a silent auction yard (Figure 24). The approach to sell these logs through a silent auction process (submission of purchase bid upon private inspection of logs), was deemed far more profitable. Some auctions resulted in over a 100% difference in bid prices for the same log.



Figure 24: Maple log with sample disc displaying birds eye feature, lined up at silent auction yard, Michigan (left), and premium hardwood logs being segregated at log yard (right)

2.4 Marketing

The marketing of the product will be linked to logistics and the approach of selling the logs and or value-added product. In the Mayar Group, Costa Rica, there are various marketing strategies for new customers and new species:

- Develop customer relationships
 - Understand customer expectations
 - Supply continuity: quality and quantity
 - Visit markets – understand where the product is going
 - Scale increases options: 1000 containers may fetch higher price than 300 containers
- (Brenes, J., pers. comm., 2019).

According to van Rensburg and Daian (2020), it is critical to understand product substitutes and the resource origin (forest/country). This is due to harvesting in many developing countries continuing until the resource is exhausted, resulting in erratic price changes when exhaustion point is reached.

Another point that was discussed during the scholarship was provenance and narrative. A SPS may have benefits in timber and beef markets where narrative of provenance can be used to market a product. Product certification (either Forest Stewardship Council or Program for the Endorsement of Forest Certification) was not a prerequisite for many of the manufacturers in China due to the

products being supplied to the Chinese domestic market, rather than more sophisticated European and US markets.

2.5 Processing

Deciding to add value to a forest product is a conundrum that many forest growers face. The risks of selling raw product in comparison to vertically integrating with value adding activities should be considered. Destination country and manufacturing plant culture can have a significant impact on perceived log quality. This perception can come from processing practices that do not fully realise the value of the log species being sold. An example of this is where AM logs were sold to a Chinese manufacturer who milled the logs green and when drying, rushed the process which “cooked” the timber, resulting in unfavourable timber performance and other issues that affected future sales to that manufacturer. This highlighted the need for consideration of either value adding or selling logs with prescriptive drying techniques to alleviate this risk (Waugh, G., pers. comm., 2019).

Entering the market too early was a risk and consistent, quality products will greatly assist lasting trade relationships (Chong, V., pers comm., 2019). Market trends in commercial and residential composite veneer products were difficult to predict (Figure 25), and this ultimately resulted in variations in his log species supply mix.



Figure 25: Vicwood China Composite wood veneers produced from peeling, then colouring, then gluing and finally slicing (left), and Dr Zhou with the Author, Victor Chong (Vicwood), Gary Waugh (Uni of Melbourne), Malcolm Celand (Hunley Management) at Vicwood

Choosing to take a vertically integrated approach to processing the AM resource provides some significant challenges and benefits. Value adding will reduce freight costs to destination market through removing waste (Lopez, *et al.*, 2009). A value-added product has quality issues removed

and will be attractive to a range of buyers. These value-added products can be one or a range of products that were inspected in China through many of the Chinese manufacturing companies including flooring, face and back veneer for feature grade panelling, form ply and decorative timber (doors, architraves, skirting).

2.6 Products

AFM, and Mayar who are charged with marketing HVT in MI/WI and Costa Rica respectively, both highlighted the importance of understanding customer needs, local legislation and market demand. Table 3 shows a prime indicator that was outlined in the product-profit ratio of the MI/WI resource:

Table 3: Product/profit ratio, HVT estate, MI/WI

Product	Portion of resource	Margin
Pulp	70%	30%
Wholewood	30%	70%

Another example of understanding products, markets and value was from a simple example AFM gave for their HVT logs:

14" small end diameter (SED) log = 2x value of 12" SED log

This example was raised multiple times in relation to piece size and price/demand. Average piece size for Victor Chong's veneer plant was a 70cm SED log, although he would consider 50cm SED which in plantation terms is very large. According to Chong, "the larger the piece size, the more desirable your product will be". This understanding and ratio was discussed in Costa Rica, where the relationship between SED and \$/m³ was not linear for HVT logs (in this example, Teak). This relationship is illustrated in Figures 26 and 27 below. Figure 26 displays the non-linear relationship between gross volume and value, whereby piece size (i.e. log size obtained through a lower stocked silvicultural regime) has a stronger influence on \$/ha value than gross volume. Figure 27 illustrates premiums that are applied to larger SED HVT plantation logs.

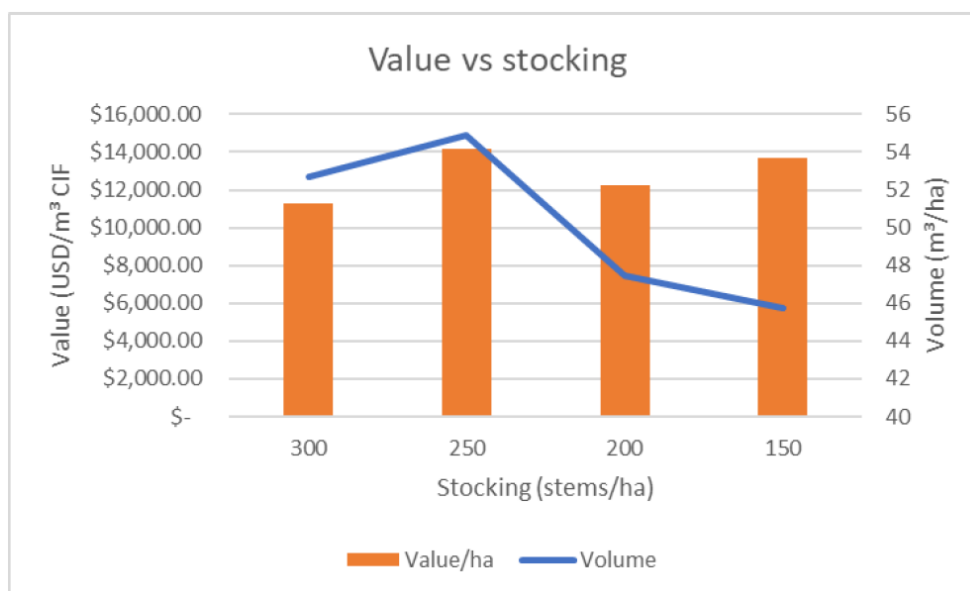


Figure 26: Value vs stocking HVT plantation timber. Illustrates by increasing piece size through lowering plantation density, and thus lowering total volume, actually *increases* value on a \$/ha basis. Source: Miller and McGrath, 2019

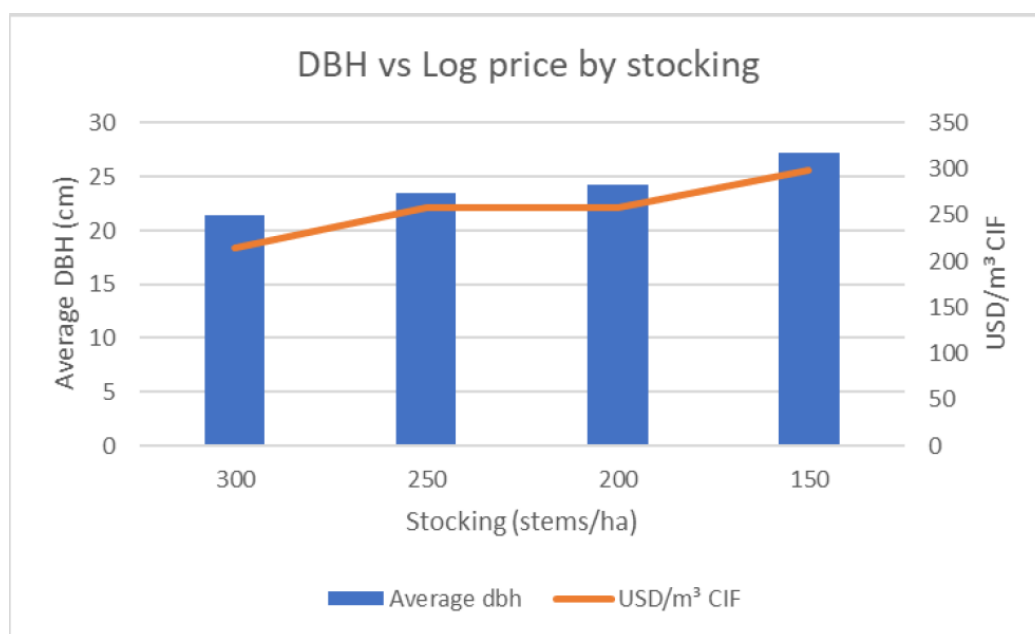


Figure 27: Diameter at Breast Height and corresponding \$/m³ by stocking. Source: Miller and McGrath, 2019

Mayar have strong connections and understanding of the Teak log market in India. The Indian market is consistent and unsophisticated, this meant that trade relationships had to be strong to ensure reliable payment for individual shipments and long term returns for investors (Brenes, J., pers. comm., 2019). Understanding destination political activity was also critical as protests and elections would often delay traders waiting for opportunities that may arise from this political activity.

Conclusion

Experiences during this scholarship have shown that there are real opportunities to add value and attract investment to NT timberlands. Investigating investment drivers from institutional investors was required to expand the timberland resource in NT timberlands and reviewing opportunities for adding value to the existing resource has provided evidence that although there are barriers to achieving growth in this area, they can be addressed. These barriers are dominantly focussing on infrastructure and emissions trading policy development. Presenting an option for sensible, integrated, sustainable and profitable timberlands by means of a SPS has revealed this system can be implemented in the NT with few barriers and many benefits. Human capital limitations that were frequently discussed throughout the author's investigations are not restrictive or problematic due to pre-existing industries in the region. Environmental services, impact investing and ESG factors are also mainly supported within a SPS as the author discovered. Capitalising on the benefits that a SPS has on emissions reduction was limited due to policy settings in Australia not yet allowing AM to participate and benefit from carbon trading.

The author developed a financial model based on the findings and experience and this further displays the attractiveness for a SPS, with modelled nominal returns of 11.1% IRR and real IRR of 9%.

Value adding the AM resource will require careful marketing and segregation to ensure optimal value is realised. Relationship building and quality assurance at the onset of harvesting, log grading and marketing will be imperative to protect the mahogany brand (FWPA, 2020).

Recommendations

- The Federal Department of Environment and the Climate Change Authority to review NPI regions and include AM and Indian Sandalwood as eligible species in the Emissions Reduction Fund to claim Australian Carbon Credit Units.
- NT/Federal Government to improve infrastructure (roads, communication, power) around existing resource to improve market opportunities and lower management costs.
- NTG to work with industry in refining the SPS that will ensure optimal results for timber, hay, and beef production on a range of sites throughout the NT.
- Industry to work collaboratively with NTG to design and execute a genetic improvement program for deployment of improved genome of *K. senegalensis*. (Figure 28).
- Industry to work with NTG to advise on sustainable land development policy that will attract more investment into plantation forestry.
- Industry to continue to build relationships with hardwood processing companies and continue to review market opportunities for the AM resource.
- Continued product development and domestic processing research to ensure that market opportunities are enhanced and refined once resource is ready for market.
- Build on recent work undertaken through the Silvicultural and Nutrition Project to ensure continual improvement for AM plantation management in the NT.



Figure 28: Author (left), with Osvaldo Corella of The Rohatyn Group, Cloned Teak plantation, Nicoya, Costa Rica

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Plain English Compendium Summary

Project Title:	Adding Value and Attracting Investment to Northern Territory Timberlands
Nuffield Australia Project No.: Scholar: Organisation: Phone: Email:	1911 Frank Miller African Mahogany Australia 9 Artaud Place Rapid Creek, NT 0810 0428532488 fmiller@africanmahoganyaustralia.com.au
Objectives	<ul style="list-style-type: none"> • To identify drivers of international High Value Timber (HVT) investments through a review of various HVT investments in North America, Central America, HVT products and markets in US and China and linking these to the Northern Territory (NT) landscape. • Identifying the foundation elements to a tree/hay/cattle system by undertaking an Investigation of tree hay/cattle system in practice in Colombia and Paraguay and assessing its feasibility within the NT landscape. • Determining if investors are interested in integrated timberland and agricultural investments by discussing directly with the decision makers of International Timberland Fund Managers. • Developing a financial model of integrate tree/hay/cattle system for potential Timberland Investment Management Organisations (TIMOs) to consider • Identifying the barriers to adding value and attracting investment to NT timberlands, and listing actions required from Industry, Government and Fund Managers
Background	<p>Currently high value timber plantation establishment has slowed, the author believes that by ensuring the products from the existing fancy timber plantations reach the highest value, and that a proposed combined “tree/cattle and cattle feed” system offers good environmental, social and financial value, this will attract new investment to fancy timber plantations in the NT.</p>
Research	<ul style="list-style-type: none"> • Michigan, Wisconsin, Costa Rica – high value timber estate management • Florida Oregon New Zealand – forest plantations investment insights • Colombia Paraguay – integrating cattle, forest plantations and cattle feed on one piece of land simultaneously. • China – processing and markets for high value timber products.
Outcomes	<p>The study revealed key barriers to expanding high value timber plantations in the NT. It identified there is an appetite to invest in integrated cattle/high value timber and cattle feed production system in the NT. This study identified opportunities to increase value of existing and future high value timber plantation project in the NT.</p>
Implications	<p>Once high value timber plantations are recognised by the Climate Change Authority, the value of the plantations will increase hence making new plantation project attractive to investment organisations to invest in the NT.</p>