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2 Executive summary

Governments in Lao PDR and Viet Nam aim for national development through building human capacity, developing industry and sustaining the environment. Forest plantations play a key role in achieving these development aims, and both countries have policies to increase plantation areas to support national goals. Objectives for plantations include: the improvement of local livelihoods, poverty alleviation, developing linkages between the processing industry and smallholder growers, and improving environmental outcomes.

While policy objectives are similar, the two countries have quite different experiences with plantations development. In Viet Nam, government investment programs supported a rapid growth in the plantation area in response to rapid decline in forest cover. In 2017, forest cover reached 41% of total land area (from a low of 28% in 1995), including about 4.2 million hectares of plantations. Under the Forest Land Allocation program, over 1.6 million hectares of plantations are now managed by smallholder growers. Based on this resource, Viet Nam has become the world's largest hardwood woodchip exporter, with an export volume in 2017 of 8.2 million BDMT (about 16 million green tonnes). The furniture manufacturing industry has also grown rapidly, the value of forest products reached USD 9,308 million in 2018, with USD 8,787 million in export value of wood-based products, making Viet Nam the world's fourth largest furniture exporter. About 30-40% of timber materials for the furniture industry are imported. The policy challenges in Viet Nam are to encourage growers to produce higher value wood for the furniture sector and demonstrate the environmental sustainability of plantation production for the international market.

On the other hand, in Lao PDR where historical forest loss has been slower and not as severe, the goal has been to restore forest cover from 40% in 2010 to 70% of land area by 2020, including 500,000 ha of plantations. This goal has not yet been achieved. The current plantation estate includes 270,000 ha of rubber, 67,000 ha of eucalyptus and acacia mostly planted by foreign investors and possibly up to 30,000 ha of teak planted by smallholders; the actual area of plantations nationwide is poorly known. In Lao PDR, plantation investment has been hampered by policy volatility and complex laws governing ownership and use of plantations, 'hold-ups' in approvals by governments at provincial and district levels and unclear property rights for industry and smallholder growers. Plantation development has caused local conflicts and controversy and a moratorium was placed on granting of new concessions in 2012. Establishment of new plantations has slowed, and future investment is uncertain. New policies are required to support increased forest cover through plantations.

The aim of this project was to provide policy options to achieve national goals for forest plantations and industry development in Lao PDR and Viet Nam through improved linkages between commercial investment and smallholder production.

Methods included: review and analysis of current policies, laws and institutions for plantation, analysis of livelihood and social impacts at 5 case study sites, economic analysis of plantation development models, analysis of supply chains and economy wide effects of the forest sector, assessment of environmental services and analysis of environmental management and protection measures for plantations. This multi-disciplinary approach provided a sound evidence base to explore new policy options.

Key findings for Viet Nam were that plantation growing is highly profitable for both state enterprises and smallholder growers. This is driving community demand for Governments to allocate more state forest land to smallholders. However, lack of transparency and accountability and poor communications are eroding trust and leading to conflicts between smallholders and state forest companies over land allocation. Short rotation acacias for woodchip in Central region provide high returns (>20% IRR) for smallholder growers. Longer rotations can be even more profitable (>30% IRR). National economic analysis supports the case to change management on a portion of plantations to increase the value of domestic timber. However, longer times for returns and perceived risks are

barriers to producing larger and higher quality logs from smallholder plantations. Poorer households, or those with small landholdings, need short-term cash flow. The project also found that the price difference between larger sawlogs and smaller pulp logs is relatively low, and that risks of storms and disease from growing trees longer are barriers for smallholder growers, and they generally lack information on price and quality requirements for different log sizes and how to produce them. Larger logs are also potentially costlier to harvest and there is limited incentive for traders to promote sale of larger logs.

Converting agricultural or degraded land to plantations can improve ecosystem services, such as increased carbon stocks, reduce sediment loads, improve water quality and biodiversity habitat and provide local environmental benefits. Extending the rotation length of acacia plantations in the North Central Coast region from 5 years to 8 years can increase average carbon stock. Putting a price on carbon by extending the Environmental Services Levy currently paid by hydropower producers to fossil energy generators of US$7-9 per tonne of CO_2-e, could provide a payment of US$547 to US$704 per ha to convert from short to long rotations. This is about one-third of the value of a 5-year plantation.

Environmental outcomes from plantations in Viet Nam can be improved by enforcing existing laws, zoning land for plantation development, and developing and implementing national standards and codes of practice for plantation timber production. Certification can demonstrate environmental sustainability and may increase the return on part of the wood produced for growers and provide higher market prices for processors. However, growers bear much of the cost of certification, while the processors get most benefits. Grower cooperatives can reduce costs to individuals, but a minimum of 3000 hectares is required to reduce the cost per grower sufficiently to encourage certification.

Key findings for Lao PDR were that the lack of a clear policy for plantation development is creating uncertainty for all investors, large and small. Regulations for establishment, management and harvesting of plantation wood were based on control mechanisms for natural forests and impose high regulatory and transaction costs that impede plantation investments. Government agencies largely act as a gatekeeper and fee collector rather than facilitating plantation development. There is weak coordination between different levels of government and between different government agencies at each level that are responsible for different aspects of plantation establishment and timber processing. Extension and advice for smallholder tree growers is limited and outdated and there is little monitoring of the environmental impacts of plantations. Independent certification is challenging and costly, especially for smallholders, and gives limited market benefits.

Local livelihood benefits from foreign plantation investment can be positive, but safeguards are needed to protect local interests and avoid adverse outcomes. Plantations can be facilitated by identifying strategic investment zones for plantations that are linked to suitable processing plant locations and markets. These can guide private and government investment and be the target for locally inclusive land use planning. Plantation development that is integrated with community needs for safe land (through clearing UXOs) and food production provides the greatest community benefits. Production Forest Areas have been degraded through poor management, overexploitation and encroachment by shifting cultivation. Plantation investment in PFAs can support partnerships in restoration between government, industry, investors and the community, However, procedures for foreign investors are uncertain, complex and inconsistent, and clear regulations and predictable regulatory costs are needed. Both environmental and social safeguards are required, particularly for communities living near and in Production Forest Areas, and must be monitored and enforced.

The project has demonstrated **policy relevance and impact** on new laws and policies. Relationships with policy makers and industry were developed through annual plantation policy forums and regular meetings in each country. Good design, strong engagement and collaboration between researchers and government, industries, NGOs and

practitioners across the three countries has led to new relationships and new thinking about plantation challenges contributed to the success of the project. The project team has built capacity through training workshops in policy and economic analysis, and collaborative research, data collection, and publication and post-graduate training in Lao and Australian universities. Results have been presented at international conferences and related initiatives.

3 Background

This project was undertaken in Lao PDR and Viet Nam; neighbouring countries in South East Asia. The two countries have a similar land area and share geographic features, forest types, ethnic groups, and governance models, together with a history of French colonial occupation, conflict and revolution leading to independence in 1975, subsequent opening and development of a market economy. However, they differ in language, culture and religion, with significant differences in population size, economic output and stage of human development (Table 1).

Attribute	Lao PDR	Viet Nam
Land Area (M ha)	24	33
Population (M)	7	93
HDI (rank) 2017	0.60 (139)	0.693 (116)
GDP (US$B)	17	224
GDP pp (US$)	2,500	2,300
Forest cover (%)	47	41
Forest pp (ha)	1.37	0.14
Urban (%)	40	34
Poverty (%)	23	12

Table 1. comparative statistics

Governments in the two countries have aims for national development through building human capacity, developing industry and sustaining the environment. The Government of Viet Nam has set an ambitious goal to become an upper-middle income country by 2035 based on balancing economic prosperity with environmental sustainability, promoting equity and social inclusion and enhancing the capacity and accountability of the state. The Government of Lao PDR aims to graduate from Least Developed Country status while realising the Sustainable Development Goals. Planted forests are seen to play a key role in achieving these development aims and both Lao PDR and Viet Nam have policies to increase plantations to support national goals.

While they have similar policy objectives, the experience with plantation development in the two countries has been quite different. Key objectives for plantations are the improvement of local livelihoods, poverty alleviation, improved linkages between the processing industry and smallholder growers and improving environmental outcomes from plantations. There are large differences in the extent of plantation development, the high level of independent household investment (sometimes supported by loan programs) and contract tree farming to industry. This is in part due to access to markets and thus price, but a range of other factors are also involved. These differences in experiences with plantation investment, within both countries and between the two countries provided a valuable opportunity for

learning about the effects of different policy and investment arrangements and which policies have been most effective in supporting plantations and related industry development. In Viet Nam, as in Lao PDR, some of the land targeted for further plantation expansion is important for local livelihoods, at least informally (McElwee, 2009; Wong et al., 2014).

In Lao PDR, the aim is to restore forest cover from the current 40% (9.5 million ha) to 70% (16.6 million ha) of the land area (including 500,000 ha of plantations) and to promote domestic processing of wood products. Achieving these goals is intended to enhance rural livelihoods and safeguard environmental services. Specific policies include encouraging international investment in plantations and processing industries, addressing illegal logging and trade (PMO 15 and Forest Law Enforcement and Governance policies), and improving the ease of doing business in Lao PDR (PMO 2). To encourage large- and small-scale private sector investment, policies were established in the 1990s to allocate land for smallholder tree growers and in the 2000s as 'concessions' to private investors (Phimmavong et al 2009, Smith et al. 2017). These policies have resulted in about 470,000 ha of tree plantations, including 270,000 ha of rubber plantation, 67,000 ha of eucalyptus and acacia and 58,000 ha of other species, being planted over time. The official estimate of smallholder teak plantation is 50,000 ha but recent assessments suggest that the area may be much less (Boer and Seneanachack, 2016).

The situation is very different in Viet Nam, where plantation development was driven primarily by public sector investment. Severe forest degradation occurred during the American war and afterwards, due to extreme poverty and government demands to generate capital by exploiting natural forests. Programs supported by government and international donors drove reforestation and plantation development from the 1990s (Smith et al., 2017). Plantation area grew rapidly and in 2017, forest cover reached 41% of total land area, including about 4.2 million hectares of plantations, with significant areas established with mixed species for forest and catchment restoration (Chu Van et al., 2013; Lamb, 2011; McNamara et al., 2006). Most planted forests were established by State Forest Companies, but plantations have gradually been allocated to individuals or households and over 1.5 million hectares are now managed by smallholder growers. Timber produced by small-scale growers is making a major contribution to the livelihoods of more than 1.4 million families (General Statistics Office of Viet Nam, 2012; MARD, 2014) and many smallholders are now planting independently, or with the support of international or government loan programs (Frey et al., 2018). In Viet Nam, timber plantations have been much less controversial than in Lao PDR. Many areas were already truly degraded (e.g. in Central Viet Nam), tree planting by smallholders was associated with the Doi Moi land reforms that gave smallholders access to land, and the greater market access and competition created very favourable financial returns to growers (Byron, 2014).

Looking globally, planted forests are expanding (Keenan et al., 2015) and there are international goals for large-scale restoration of degraded forest lands. Forest tree plantations are a subset of planted forests and have been established to produce industrial wood, fuelwood, biomass for energy and non-timber forest products; to restore degraded lands; to sequester carbon and to improve water quality. Plantations are also used for recreation and can provide other social benefits (Bauhus et al., 2010; Paquette and Messier, 2009). Increased demand for forest products in East, South and South East Asia and higher plantation growth rates forest is leading to forest product companies to acquire suitable land for plantations in this region (Silvicapital, 2013; Stora Enso, 2014; Vermeulen et al., 2008). Lao PDR is considered particularly attractive because of good tree growth conditions, the large area of degraded land and low population density.

Plantation expansion has generally been supported by government and industry around the world, but tree plantations have often been controversial due to conflicts over land, impacts on local communities and the environment, or concerns about conversion of natural forests to plantations (Gerber, 2011; Kanowski and Murray, 2008; Schirmer, 2007). This is true in Lao PDR (Baird, 2014) and Viet Nam (McElwee, 2009). Governments and many private

plantation investors are seeking new approaches for plantation investment that avoid these conflicts and increase benefits to local communities (Gerber 2011, Kanowski and Murray 2008, Vermuelen et al 2008, NGP 2014).

A recent global study found that impacts of plantation development on communities had often been negative. Positive impacts of plantation investments were associated with secure local land titles, community capacity to negotiate fair land transfers, complementary interaction between plantations and other land uses, and the generation of stable local employment in plantation management and wood processing. Given the time needed for plantations and associated industries to develop, benefits tend to accrue over time (Malkamaki et al 2018). A common feature of approaches with positive outcomes is therefore strong community engagement and partnership with smallholder growers.

The shift from net forest loss to net forest gain through natural regeneration or planted forests is described as a 'forest transition' (Meyfroidt et al., 2018; Rudel et al., 2005) described two possible pathways for such transitions: the 'economic development' pathway leading with higher wages and increasing urbanisation leading to increased costs of agriculture, less forest clearing and abandoned agricultural land; or the 'forest scarcity pathway' where demand for forest products and environmental services increases with agricultural expansion and reduced forest cover, leading to increased investment in forests. A third, 'smallholder, tree-based intensification' pathway can result from dynamics at a small farm scale (Pokorny and De Jong, 2015), with trees incorporated into farms resulting in a "tree cover transition" that extends beyond what is usually defined as forests (van Noordwijk et al., 2014).

The two countries in this study are at quite different stages of forest transition. Despite national policies to restore forests, cover continues to decline in Lao PDR, while there has been a rapid increase in forest cover in Viet Nam, with the forest scarcity pathway considered the main explanation. Policies allocating forestry land to households, local scarcity of forest products, and increased international demand for timber contributed to forest cover increases. Evidence for the economic development path is are more ambiguous (Meyfroidt and Lambin, 2008).

In Lao PDR, plantation investment has been hampered by complex laws governing ownership and use of plantations, 'hold-ups' in approvals by governments at provincial and district levels and unclear property rights for industry and smallholder growers. Plantation development has often caused local conflicts and controversy and a moratorium was placed on granting of new concessions in 2012. Establishment of new plantations has slowed and future investment in plantations is uncertain. Both the Land Law and Forest Law and supporting regulations are currently being revised to facilitate investment in large- and small-scale tree plantations, and other forms of tree growing such as out-grower programs, agroforestry and forest landscape restoration.

Five major foreign investors were allocated concessions to develop plantations for wood products: Swedish investors Burapha Agforestry Company, Brierley Investments (transferred to the Japanese company Oji Paper Ltd and now owned by the Australian company NewForests Ltd), the Indian company Birla Lao Ltd a subsidiary of Aditya Birla Ltd, Scandanavian Stora Enso Lao Ltd and the Chinese company Sun Paper. Companies granted concessions have had difficulty meeting land acquisition targets to support processing investment. For example, Aditya Birla Ltd was granted a concession to develop 50,000 ha of plantations in Savannakhet province that would support the investment of US$350 million in a dissolving pulp mill and employ over 2500 people in plantation management and mill operation. However, due to problems with securing land, Birla Lao has put this operation on hold, with only 15,000 ha established. They have recently sold this estate to Sun Paper.

Other companies (e.g. Stora Enso Lao Ltd) have adopted a more participatory approach to engagement with local governments and communities, implementing a partnership model to improve local livelihoods and integrate local land uses such as rice and other food crops.

However, there are significant policy barriers to the expansion of this approach, including concession agreement processes and land allocation arrangements.

Smallholder plantation development in Laos is focused on teak in Luang Prabang and Xayaboury Provinces (Newby et al., 2014; Newby et al., 2012), with smallholder rubber occurring throughout the country. Complex policy settings for plantation registration, harvesting, transport, marketing, manufacturing and export has meant limited benefits have flowed from this resource. Rubber plantations expanded rapidly (Cramb et al., 2015) but there have been significant concerns about land allocation processes (Vongvisouk et al., 2014) and impacts on human health and soil degradation Wong et al. (2014).

On the other hand, the plantation-based forest sector in Viet Nam has become a significant contributor to national economic development. In 2018, forest cover reached 13.7 million hectares (41.7% of total land area). The plantation sector has grown rapidly, there are now about 4.2 million hectares of plantations (31% of the forest area in 2017), with over 1.5 million hectares managed by smallholders. Timber production increased to 18.5 million cubic metres in 2018, 2.8% higher than 2017, with all the increase from plantation harvest (MARD, 2018). Most of this production is exported as woodchip. The furniture manufacturing industry has also been growing rapidly. Viet Nam is now the world's fourth largest furniture exporter, with the value of wood exports reaching USD 9.34 billion in 2018, 15.7% higher than 2017. This sector needs 8-9 million m^3 of round wood, Small-scale sawmills supplying sawn wood to furniture manufacturers (Byron 2014). but much domestic supply is not suitable quality or in the right locations for this industry and 49 percent of demand for round wood for furniture is imported. The furniture sector sells into international markets, with an increasing demand for certified products.

Current forest sector strategies in Viet Nam include restructuring state enterprises, developing functioning land markets, increasing participation in global value chains, fostering innovation, internalisation of environmental costs and building climate resilience. The Government is developing policies encourage a change in plantation management to produce more suitable local wood to reduce imported timber for wood processing industries. This includes planting 200,000 ha of long rotation plantations and converting 90,000 ha of plantation forest from short rotation to long rotation. The Government also aims to increase the area of certified production forests to 30% of the total area by 2020.

This project was developed in formal meetings and consultation workshops in Vientiane and Hanoi in early November 2014 to define key forest management problems, research priorities and approaches to address these, and potential partnerships to undertake the research. These indicated that policy and institutional arrangements are not facilitating capital investment, supporting industry development or providing maximum opportunity for smallholder involvement. These meetings generated the following questions:

- How well do current policy arrangements for tree plantation development in Lao and Viet Nam support national development goals for smallholder involvement and what are the challenges and gaps in policy to meet these goals?
- How do the range of recently implemented approaches to plantation development in Lao PDR, Viet Nam and other countries in the region differ in terms of benefits and costs – for smallholder livelihoods and broader economic, social and environmental impacts – and how are these distributed among stakeholders?
- What policy, institutional and governance options can optimise the contribution of plantation development to smallholders and the community while providing incentives for capital investment, and how can they be implemented?

Evidence generated to address these questions could provide a stronger basis for plantation policies that meet broader national development objectives (including the improvement of smallholder and rural community livelihoods), facilitate appropriate industry investment and enhance environmental benefits from plantations. This research project

evaluated current policies and identified key issues for resolution for plantations to meet the goals of national governments and local communities.

The project is consistent with the Australian Government's aid policy to support private sector development through innovative partnerships models and engaging local producers with global markets. It was also designed to support the priorities of ACIAR's Agricultural Development Policy Program of improved environmental management, appropriate local and community property rights and support for smallholders to interact in market economies.

For Lao PDR, the project meets the following priorities identified in ACIAR's 2014-15 Operational Plan:

- efficient and sustainable forestry industries, including non-timber products, with suitable climate change resilience
- research to improve food security from rice-based and other (including timber) farming systems in southern Lao PDR, along with technical and agribusiness research collaboration.
- improved institutional, training and communication frameworks that enhance the capacity development of researchers and educators and
- improved natural resource management that benefits livelihoods and food security, through delivering land-use options to smallholders

For Viet Nam, the project contributes to the goals of human resource development, improved economic integration within the forest sector and environmental sustainability and addresses the 2014-15 Operational Plan priority, of "advancement towards higher-value plantation forestry products."

4 Objectives

The aim of this project was to provide policy options that achieve national goals for forest plantation industry development in Lao PDR and Viet Nam through improved linkages between commercial investment and smallholder production.

Objectives

1. To develop policy and institutional options for plantation development;
2. To understand the positive and negative social, economic and environmental impacts associated with different tree plantation development approaches;
3. To create a network for policy learning that builds capacity in plantation sector policy analysis, development and implementation

These objectives are interlinked. With the outputs from case study analyses under objective 2 informing the development of policy options under objective 1. The project took a multi-disciplinary and multi-level approach to assess the impacts of plantation development and the policy options to address key challenges. In undertaking research on social, economic and environmental factors at local and national levels, the team was able to explore the multiple dimensions of plantations and policy options.

Objective 1. Activities

- Review and analysis of context, institutional processes and organisational structures and social factors for plantation development.
- Economic analysis of current policies and implications for small grower livelihoods.
- Analysis of environmental management and protection measures for plantations.
- Supply chain analysis for plantation industry.
- Analysis of policy options to support transition to higher value production by small growers.
- Development and analysis of alternative plantation policies.

Objective 2. Activities

- Data collection and analysis of household level social, human and financial capital and community livelihood strategies at 5 sites. For two of these sites, one in Lao PDR and one in Viet Nam data collection and analysis will be completed prior to the mid-term review of the project, so that insights and outcomes from this work can be shared with the mid-term reviewers.
- Analysis of larger-scale industry or small-scale investor returns and risks at 5 sites.
- Analysis of economy wide effects of plantation development at two sites.
- Analysis of natural capital and environmental benefits and impacts.

Objective 3. Activities

- Training workshop in policy analysis in Lao PDR.
- Training workshop in economic analysis in Viet Nam.
- Study tour and workshop in Thailand on plantation governance and supply options.
- Meetings of a plantation policy forum involving government, industry, other stakeholders and community, and engagement with other fora.
- Presentations and conferences and engagement with related initiatives.

5 Methodology

The project involved evaluating current policies and building an evidence base for policy change. This was a multi-disciplinary approach involving quantitative economic and qualitative social and policy research undertaken in partnership with government policy makers. The project logic in Appendix 1 describes the levels of investigation and analysis, streams (economic, socio-political and environment), research activities, processes and outcomes. The activity table in Appendix 1 indicates the agencies and people involved in the project activities.

There was a strong interaction between the three objectives; with results from activities in Objective 2 informing the development of policy options in Objective 1.

The project began with a context analysis of existing plantation and related policies in the two countries and an analysis of existing institutional processes and organisational structures. Existing policies were assessed using criteria based on stated government objectives, developed in discussion with policy makers, using program logic to organise the evaluations (Objective 1). The effect of different approaches to plantation development and local institutions and organisations on livelihood resources, livelihood strategies and livelihood outcomes were assessed at five case study locations (Objective 2). These were used to assess the implications of different approaches to plantation land acquisition and as a basis for new policy arrangements (Objective 1). The project undertook a range of activities that built capacity for policy analysis and implementation (Objective 3).

The Viet Nam Academy of Forest Sciences led and coordinated activities of project partners in Viet Nam. The National University of Lao PDR coordinated project partners and collaborators in Lao PDR.

5.1 Objective 1. Develop policy and institutional options for plantation development

5.1.1 Context Analysis, Institutional Processes and Organisational Structures

The methods in this component included document analysis and interviews with key informants across government, non-government organisations and industry in each country. Analysis of environmental and social factors including certification arrangements for plantation timber production, included drivers and demand issues, extending the analysis undertaken in ACIAR project *FST/2010/012 Enhancing key elements of value chains for plantation-grown wood.*

This analysis provided a basis for assessing problems and issues with current legislative and policy arrangements. It considered:

- impediments to plantation investment and ensuring security for investors and integration with other land uses;
- current risks to plantation production and the availability and utility of current risk management arrangements such as insurance;
- interactions between different levels of government (national, provincial, district) between relevant government agencies, and between government and other actors; and
- incorporation of environmental management and protection measures into policy design.

5.1.2 Supply chain analyses

This component considered the supply chain and financial impacts and barriers to smallholder and industry investment, including the effects of taxes and charges on land, trees and other factors of production, incentives for plantation production, extension and technical support, subsidies for longer rotation or higher value production and risk management tools (such as insurance) and other financial arrangements to support a transition to higher value production by small growers and their implications for livelihood outcomes and private sector returns.

This involved analysis of supply chains for woodchips and timber in Viet Nam and teak furniture production in Lao PDR. Through workshops and individual interviews with producers and buyers at different stages along the chain, supply chain structures were mapped and data was collected on and buying and selling prices, firms or individuals carrying out different functions, margins, profitability, distribution of returns, capital costs, transaction costs and taxes along the chains.

5.1.3 Analysis of alternative policies

Policy options were developed with government partners and discussed in Plantation Policy Forums and Steering Committee meetings. Policy options were aimed to:

- increase the level of smallholder participation in plantation activities, and associated poverty and livelihood impacts;
- reduce levels of conflict over land use, and associated conflict resolution issues such internal community power relations, equality of engagement across different social groups, strengthening social capital, facilitating trust and reducing negotiation costs;
- consider the distribution of economic benefits at national, regional and community levels;
- enhance product value and market access for smallholders;
- develop incentives for investors in long rotation plantations in Viet Nam;
- increase environmental benefits associated with plantations.

5.2 Objective 2. Understand the positive and negative social, economic and environmental impacts of different tree plantation development approaches

5.2.1 Plantation development case studies

The aim of this component was to provide a comprehensive picture of the effects of plantation development that can be used to inform development of alternative policy arrangements. In Lao PDR and Viet Nam, seven research sites (five plantation models) were selected for in-depth case study fieldwork (Tables 2-4):

1. Smallholder-led short and longer rotation acacia plantations in Thua Thien Hue and Quang Tri Provinces (6 villages) Viet Nam;
2. Private company-led short-rotation Eucalyptus plantations in Atasapangthong District, Savannakhet Province (Birla Lao Ltd), Lao PDR.
3. Private company (Stora-Enso Ltd)-community partnerships for eucalypt plantations in Nong District, Savannakhet and Ta Oy, Salavane Province, Lao PDR;
4. Private company-led production from short-rotation Eucalyptus plantations in Pakkading District, Bolikhamsai Province, Lao PDR (Lao Forest Plantations Ltd, now Mekong Timber Plantations)

5. Private company (Burapha Ltd)-community partnerships for eucalypt plantations in Hinheub District, Vientiane Provinces, Lao PDR;
6. Smallholder-led Yang Bong production in Xepon District, Savannakhet Province.

These sites had differences in relative roles of smallholders, communities, government and industry investors, and differences in species and products, harvest timing and marketing arrangements. They also differed in their supporting incentives, capital investment, commercial objectives, community engagement, technical inputs, markets, supply-chains, their physical setting and environmental conditions. In general, similar approaches were used in each country.

In Lao PDR, six community field sites across five Lao provinces were selected (Barney and Van Der Meer Simo, 2019). Fieldwork of between 3-8 weeks per community was conducted during 2016-2017. Community research sites were randomly selected from a sample of villages with a minimum 50 hectares of tree plantations under a given model. In the contract farming case model, no village met the minimum 50 ha. criterion, and so a village with a significant number of contracted households was selected. In the fourth independent smallholder case, staff of the District Agriculture and Forestry Office (DAFO) of Xepon suggested a village that met the 50 ha criterion.

In Viet Nam, six villages in three districts of Hue and Quang Tri provinces were selected for the study (Huynh and Keenan, 2019). While the plantations in Hue are mainly developed and managed by smallholders, communities, and commune people's committees, Quang Tri has approximately 20% of the total plantation forests managed by State Forest Enterprises (SFEs). The two districts in Hue province were selected to reflect differences between the lower/flat lands of Binh Dien district and the highlands of Nam Dong district. Binh Dien is mainly inhabited by Kinh people, both migrants and locals. Nam Dong has a high population of ethnic minorities (both indigenous and immigrants from the Northern mountains), who live in more remote areas. Alternatively, the two village field sites in Quang Tri province were chosen due to differences in demographic composition. Ban Chua is an indigenous village while Tan Quang only has Kinh farmers.

Within their respective country contexts, the case studies represent a continuum on the relative role of smallholders, communities, governments and corporate investors, in the ownership and management control over commercial tree growing. The sites differ in terms of the scale of plantations, the key actors and investors, the land tenure arrangements, levels of community participation, management inputs, end value-chains, and benefit arrangements. In each case we trace the outcomes of tree planting for local socio-economic livelihoods and provide context in terms of impacts upon access to resources and environmental management.

No 'control' study villages were established with the aim of establishing a baseline livelihood comparison of villages without plantations. This was for three main reasons. First, given the high levels of economic, socio-cultural, and landscape diversity in rural Lao PDR, in our view it would be difficult to account for the many confounding (i.e. non-plantation related) factors that also contribute to livelihood changes. Secondly, given the relatively small number of communities sampled, the conclusions from a control village comparison would not hold statistical validity, and would be only suitable for broad comparisons. Third, given limited resources, inclusion of control villages would also have restricted the number of plantation models that could be examined. In our view this approach does not render our results as anecdotal, or without rigour. In terms of research design, we follow a case study logic not a sampling logic (Small, 2009), and, while some statistical analysis has been performed. Overall we did not seek to draw statistical generalisations based upon the isolation of key variables (Steinberg, 2015). To better understand the relationship between tree plantation models and livelihood changes in Lao PDR we focus upon generating logical causal inferences and generalisations, from 'small-N' case analysis (Flyvbjerg, 2006, Miles et al., 2018). The case analysis is therefore drawn from the existing situation with tree plantations and livelihoods in Lao PDR, not

from best-case or ideal-case scenarios, and this means that our analysis is embedded in local contexts, which can include issues of both market failure and state or corporate regulatory failure. Our empirical insights and arguments and our conclusions should therefore be interpreted in these terms.

Fieldwork was guided by the 'Sustainable Livelihoods' framework (SLF), as developed by Scoones (1998). The SLF approach facilitates the investigation of different capabilities, assets, and strategies that people follow to make a living (Chambers and Conway, 1992). Livelihood strategies are composed of a portfolio of activities that people undertake to achieve certain livelihood goals (Allison and Ellis, 2001, Brown and Brown, 2006). Because rural households often undertake a wide range of activities in securing a livelihood, precise operational definitions of different livelihood strategies remain elusive (Barrett et al., 2001, Brown and Brown, 2006). Although income alone is not a complete measure of livelihoods wellbeing, household income does offer a clear parameter for understanding livelihoods. However, livelihoods can also be non-cash based, such as in terms of access to key resources. The sustainable use of the natural environment, in a way that does not compromise the requirements of future generations, should also be considered in a SLF. Equally necessary is to understand how the external environment shapes livelihoods and access to resources (Krantz, 2001), including the shocks, stresses, and trends over which individual households may have limited control.

Land is the foundation for all farm-based livelihood strategies. Determining who gets access to land, and who is excluded to what type of land, is inevitably a political question, involving questions of authority and power (Scoones, 2015). Against this background, our assessment of livelihoods in each case study starts with a description of the institutions and patterns of land governance in each village. As with any other asset, access to land is hindered or facilitated by the policy, institutional and vulnerability contexts in which households operate.

We did not establish quantitative indicators of social capital (such as through social network analysis) or natural capital (e.g. through natural capital accounting). Rather, in-depth fieldwork in the community sites facilitated qualitative insights into household participation in formal and informal institutions, and how villagers participated in the plantation development process. There was also some flexibility and divergence in the fieldwork methodology, and each lead researcher used a slightly different style and approach, and the longer period of fieldwork conducted by van der Meer Simo allowed for more extensive data collection on use of non-timber forest products and the importance of 'environmental income' to local livelihoods.

Surveys – including with both participating and (where applicable) non-participating villagers– inquired into the household economic contribution of plantations, labour opportunities and conditions, how people were earning a living from both plantations and local natural forest-fallow in landscape mosaics, and the impacts of tree plantations upon environmental resources and household wellbeing. Detailed quantitative surveys, with open and closed questions, combined with observations and extended interviews, were also undertaken to identify current household asset portfolios, and included questions on: household and communal land and property; credit arrangements; patterns and diversification of incomes (both forest-based and non-forest environmental incomes) and expenditure; type and scale of land holdings and tenure regimes; livelihood diversification including migration and remittances; pathways of agricultural intensification; and other indicators of resilience or vulnerability. van der Meer Simo's more detailed quantitative data was managed and analysed with Microsoft Access, Microsoft Excel and SPSS (version 24) for descriptive and analytical purposes.

Focus group discussions (FGDs) were also held in each community research context. In Lao PDR flexible and at times opportunistic arrangements were used to engage men, women and village elders separately in group discussions. The topics for FGDs revolved around village characteristics and history, forest development and management, resource use, plantations and livelihoods, and observed changes in environment and wellbeing.

Systematic quantitative livelihood analysis was conducted in the case villages- with the most detailed datasets developed by van der Meer Simo. In his cases, annual livelihood income was estimated as the sum of all cash and subsistence income-generating activities over a 12-month period prior to data collection. Subsistence income refers to 'in-kind', 'non-cash' or 'use' income; or "the value of products being consumed directly by the household or given away to friends and relatives" (CIFOR, 2007). Estimates for annual income that households derive from tree plantations was contextualised within the wider spectrum of activities that they undertake for a living. To this end, livelihood strategies are classified in four categories: 1) tree plantation income; 2) fixed agriculture income; 3) swidden agriculture and environmental income; and 4) non-farm income. In one case a fifth category was included, namely income earned from leasing agricultural land to banana companies. The rationale for these income categories was as follows:

(i) Incomes from the identified tree plantations include, where applicable, company compensation and Village Development Fund benefits, wage labour, sale or consumption of plantation intercrops and sale or consumption of plantation products (e.g. wood, bark).

(ii) Fixed agriculture income represents that from continuous production of agricultural crops such as paddy rice, cassava, fruit trees and vegetables, grown in permanent plots. Most typically, the tenure arrangements involve parcels of land that households own or lay claim to, using household labour.

(iii) In Lao PDR, many farmers engage in rotational swidden agriculture, which forms diverse agro-ecological landscapes that are important in sustaining their livelihoods. These landscapes are used for upland rice cultivation, the collection of environmental products (fuel wood, wildlife, and forest and non-timber forest products), and as pasture areas for livestock. Thus, we include free-range livestock that households have consumed or sold, in addition to the environmental products and the benefits from swidden agriculture, sold or consumed, within the category of environmental income. Environmental income refers to income from all plants and animals that informants harvested from primary and secondary natural forests, and from other non-forest lands such as grasslands, wetlands, swidden fields, rivers and ponds (Sjaastad et al., 2005).

(iv) Non-farm-based strategies comprise all "activities outside the agricultural sector, regardless of location or function" (Barrett et al., 2001). In this category we include wages and financial remittances from non-farm work occurring outside of the locality (including civil servant wages), income from engaging in commercial trading in livestock, cash crops or timber, income from small shops and services, and income from wages earned working on others' property.

Some villager's income activities, such as the sale of timber from natural forests, are illegal, and thus income from these sources is difficult to document. We sought to account for this limitation through data triangulation from different sources, however income from these activities may still be under-reported by respondent households (Parvathi and Nguyen, 2017). Data from the sites led by van der Meer Simo were further transferred to SPSS (IBM SPSS Statistics v24) for closer analysis of incomes.

Table 2: Research Tools used in livelihood research

Tools/Countries	Lao PDR	Viet Nam
1. *Detailed household surveys and accompanying semi-structured interviews*	146 Households	150 Households
2. *Focus group discussions*	7 groups (between 10-15 participants each group)	6 groups (between 10-15 participants each group)
3. *Transect walks and village plantation site visits*	✓	✓
4. *Participant observation*	✓	✓
5. *Community historical timelines*	✓	
6. *Personal and family histories of selected village elders*	✓	
7. *Unstructured interviews based upon everyday encounters and conversations*	✓	
8. *Participatory sketch mapping*	✓	
9. *Photo elicitation*	✓ (in 3 sites)	
10. *Household NTFP diaries*	✓ (in 3 sites)	

Table 3: Viet Nam Field Sites

#	*Village*	*Indicative community livelihood strategies*	*Demographic Composition*	*Distance to processing factories*	*Plantation Arrangement*
1	Hoa Cat Village, Binh Dien District, Hue Province	Agricultural crops, acacia plantation, small business	All Kinh people, immigrants from New Economic Zones Program	Low land, 5-10 km factories.	Mainly smallholders, some involvement (labour) with SFEs
2	Phu Thien, Binh Dien District, Hue Province	Agricultural crops, acacia plantation, small business	All Kinh people, immigrants from New Economic Zones Program	Low land, 5-10 km factories.	Mainly smallholders, some involvement (labour) with SFEs
3	Phu Mau, Nam Dong District, Hue Province	Agricultural crops, acacia plantation, animal husbandry	Mixed Kinh and ethnic minority people	Highland, 15-30 km to factories	Mainly smallholders, limited involvement (labour) with SFEs
4	Xuan Phu Village, Nam Dong District, Hue Province	Agricultural crops, acacia plantation, animal husbandry	Mixed Kinh and ethnic minority people	Highland, 15-30 km to factories	Mainly smallholders, limited involvement (labour) with SFEs
5	Ban Chua, Cam Lo District, Quang Tri Province	Agricultural crops, acacia plantation, wage labour	Mainly ethnic minorities	Low land, 5-10 km factories.	Smallholders with strong involvement (labour) with SFEs.
6	Tan Quang Village, Cam Lo District, Quang Tri Province	Agricultural crops, acacia plantation, wage labour	All Kinh people, immigrants from New Economic Zones Program	Low land, 5-10 km factories.	Smallholders with strong involvement (labour) with SFEs

Table 4: Lao Field Sites

#	Community case (District name)	Plantations developers; size; year of establishment	Species	Production system	Indicative community livelihood strategies	Land tenure	Tree and understory tenure
1	Atsapangthong Savannakhet Province	Birla Lao (BLPP)	Eucalyptus	Eucalyptus (block 3m by 3m spacing)	Labour migration & remittances; livestock; lowland rain fed rice production & sale	State land concession to company. Non-participatory land zoning	Company ownership of trees, no intercropping
2	Nong Savannakhet Province	Stora Enso Lao PDR; 70 hectares; 2014	Eucalyptus	Eucalyptus with alley cropping agroforestry (rice)	Sale and consumption of environmental products and livestock; upland (swidden) rice; local wage labour; SEL plantation labour; SEL Village Development Fund	State land concession to company, Participatory land use planning (PLUP)	Company ownership of trees, intercropping options for rice during years 1 and 2
3	Ta Oy Salavane Province	Stora Enso Lao PDR	Eucalyptus	Eucalyptus with alley cropping agroforestry (rice)	Sale of (illegal) timber and livestock, upland (swidden) rice, local wage labour, SEL plantation labour, NTFPs, SEL Village Development Fund	State land concession to company, Participatory land use planning (PLUP)	Company ownership of trees, intercropping options for rice during years 1 and 2
No	*Community case (District name)*	*Plantations developers;*	*Species*	*Production system*	*Indicative community livelihood strategies*	*Land tenure*	*Tree and understory tenure*

#	Community case (District name)	Plantations developers; size; year of establishment	Species	Production system	Indicative community livelihood strategies	Land tenure	Tree and understory tenure
		size; year of establishment					
4	Pakkading Bolikhamsai Province	Oji-LFPL; 37 hectares; 2010	Eucalyptus	Smallholder eucalyptus	Sale of agricultural cash crops (cassava), paddy rice, livestock, & environmental products (fish); sale of rubber latex and eucalypt wood.	Smallholder land ownership (plantations are registered)	Farmer-owned and managed, contract for sale to company
5	Xepon Savannakhet Province	Independent smallholder; 162 hectares; staggered increments since 2005	Yang Bong	Agroforestry: Yang bong with rice and bananas	Sale of yang-bong (*Persea kurzii*) and bananas; lease of agricultural land; trade in illegal wood; livestock sales; sale and consumption of environmental products.	Smallholder land ownership (plantations are not registered)	Farmer-owned and managed
6	Hinheub Vientiane Province	Burapha agroforestry; 605 hectares; staggered increments since 2013	Eucalyptus	Eucalyptus with alley cropping agroforestry (rice)	Plantation forestry wage labour and sale of intercrop rice; sale of agricultural cash crops, livestock, and	Village lease to company, Participatory land use planning	Company ownership of trees, intercropping options for rice during years 1 and 2

#	Community case (District name)	Plantations developers; size; year of establishment	Species	Production system	Indicative community livelihood strategies	Land tenure	Tree and understory tenure
					environmental products.		

5.2.2 Analysis of forest production systems

This analysis investigated different factor inputs (land, labour, capital, technology) and returns (per unit of labour, land or capital investment)

Net Present Value (NPV) was used as an indicator of financial profitability, but this may be misleading if not used properly. For example, when using NPV, the duration of two different crops varies seasonally so present value was annualized by using a formula that converted NPV into an annual equivalent value (AEV). Land Expectation Value, the present value of the projected costs and benefits over an infinite time horizon was used to estimate the value of bare land in perpetual timber production. LEV is commonly used to compare plantation investment project with different rotation lengths. Internal Rate of Return (IRR), the rate of return or profit expected from investment projects or the discount rate at which NPV equal to zero was also used. Sensitivity analysis was used to assess the impact of variation in stumpage price and timber yields.

In Viet Nam, the financial analysis was conducted with Ben Hai SFC, in Quang Tri Province, in the Central Coast Region of Viet Nam. Ben Hai SFC manages 7,357 ha production forest including 5,730 ha of planted forests and 1,628 ha of natural forest. Ben Hai SFC has been planting acacia with different densities and rotation age, as part of normal business for many years. The research team obtained records of all costs and benefits from different plantation options from the company registers and these were transcribed into English. Price and yield data were triangulated and supplemented from formal and informal interviews with other forest stakeholders including government departments and the woodchip and sawmill industry and smallholders in the Quang Tri Province. All costs and benefits for individual years were discounted to present terms, with 7% and 12% discount rates. The 12% discount rate was chosen because it was the common nominal interest rate 10-12 years ago. It is now around 7%.

In Lao PDR, analysis was undertaken using data from Burapha Agroforestry Co., Ltd a company operating in four Provinces of Lao PDR: Vientiane Prefecture, Vientiane Province, Xayaboury Province, and Saisomboun Province. The company has adopted an agroforestry model that involves the participation of villagers. Trees are planted at a wide spacing and the local communities use the space between tree rows for upland rice production (year 1). Up to 2017, the company had received the approval of land use rights for approximately 7,961 ha of land and planted about 3000 ha with mainly *Eucalyptus camaldulensis* (or hybrids including E. *urophylla*, E. *pellita*, or E. grandis), with a few plantations of *Acacia auriculiformis*. For the model, the spacing for intercropping with cassava is either 9m x 1m or 6m x 1.5m while that with rice are 9m x 1m, 6m x 1.5 m, and 4.5 m x 2 m. The intercropping of agricultural crops is done in the first year of plantation establishment. Sometimes, in areas far from villages and available labour, the company uses a spacing 3m x 3m if intercropping is impossible. While farmers in the villages are provided user rights to individual plots to grow rice or cassava between the trees, the company leases the entire plantation area for up to 30 years.

The data used in analysis of representative plantation models were derived from a combination of company sources and field investigation in Vientiane Province. Data on plantation afforestation cost, management cost, and other input costs of representative Eucalyptus plantation were collected from the enterprise and from households by interviews by a team of researchers from the Faculty of Forest Science, National University of Lao PDR with the help of the local staff of Provincial Agriculture and Forestry Office. We made several field visits to plantation sites to confirm information given in the interview notes and in company documents. The company provided growth and yield data based on a well-maintained trial. Mean annual increment (MAI) for both Eucalyptus monoculture and Eucalyptus intercropped with rice plantation was 28.6 m3 ha-1 year-1 and Eucalyptus intercropped with cassava is 26 m3 ha-1 year-1.

The proposed rotation period is 7 years. The expected average price of timber at farm gate of US$48/$m^3$ was obtained from the Company (in 2016). This did not include the cost

of transportation (from the point of harvesting to the market or factory). A discount rate of 12% was based on the interest rate on borrowings from the Agriculture Promotion Bank, the only state bank in Lao PDR which gives loans to agriculture and forestry investment.

5.2.3 Economy wide effects

In Viet Nam, this study aimed to determine the contribution of the forest sector in the national economy based on the analysis of the Input-Output table based on the GSO's data, as well as the effects to value added of other sectors in the economy. This provided information on the contribution of the forest sector to Gross Domestic Product (GDP) and the value added of the forest extraction subsector. The study used data from an input-output table of the Viet Nam economy most recently developed in 2012 and updated and restructured it into a table for 2016. The sources of updated data were obtained by:

- Updating output vectors from Viet Nam enterprise survey carried out in 2016
- Calculating intermediate input vector from enterprise survey and Viet Nam Household Living Standard Survey carried out in 2016
- Including the forest extraction subsector as a separate sector in the IO calculation

In Lao PDR, the impact of a 300,000 tonne/yr bleached kraft pulp mill was examined using data from an input-output analysis of Savannakhet economy. This project will involve plantations of trees to supply approximately two million green tonnes of wood (Eucalyptus and Acacia) per year. 100,000 hectares of new plantations will be needed to feed the new pulp mill. At present, approximately 200,000 green tonne per year is available Lao PDR and the remaining resources of 1,800,000 green tonne are likely to be imported from Thailand (Eucalyptus) and Viet Nam (Acacia). It is assumed that all mill production is exported. The average pulp price in China, representing prices in the East Asia market, are used in the analysis. The study modelled the effects on 6 aggregated sectors in the provincial economy. The study uses a dynamic general equilibrium model to examine the economy-wide impact of forest plantation development in Lao PDR. Analysis focussed on the Government of Lao PDR' forest policies to promote the development of forest plantation by the year 2020 (Phimmavong, 2012).

5.2.4 Natural capital and environmental benefits and impacts

Ecosystem services assessment can take different forms. This study used a framework developed during the project (Baral et al. 2017) and applied it in two provinces in the north-central coastal area of Viet Nam, Thua Thien-Hue and Quang Tri (Figure 1). Similar studies were not possible in Lao PDR because the area of plantation that has been established is relatively small and input data sets are not generally available. A Masters student, Britta Held from Justus Leibig University studied potential changes in ecosystem services under different plantation development scenarios. This is described below.

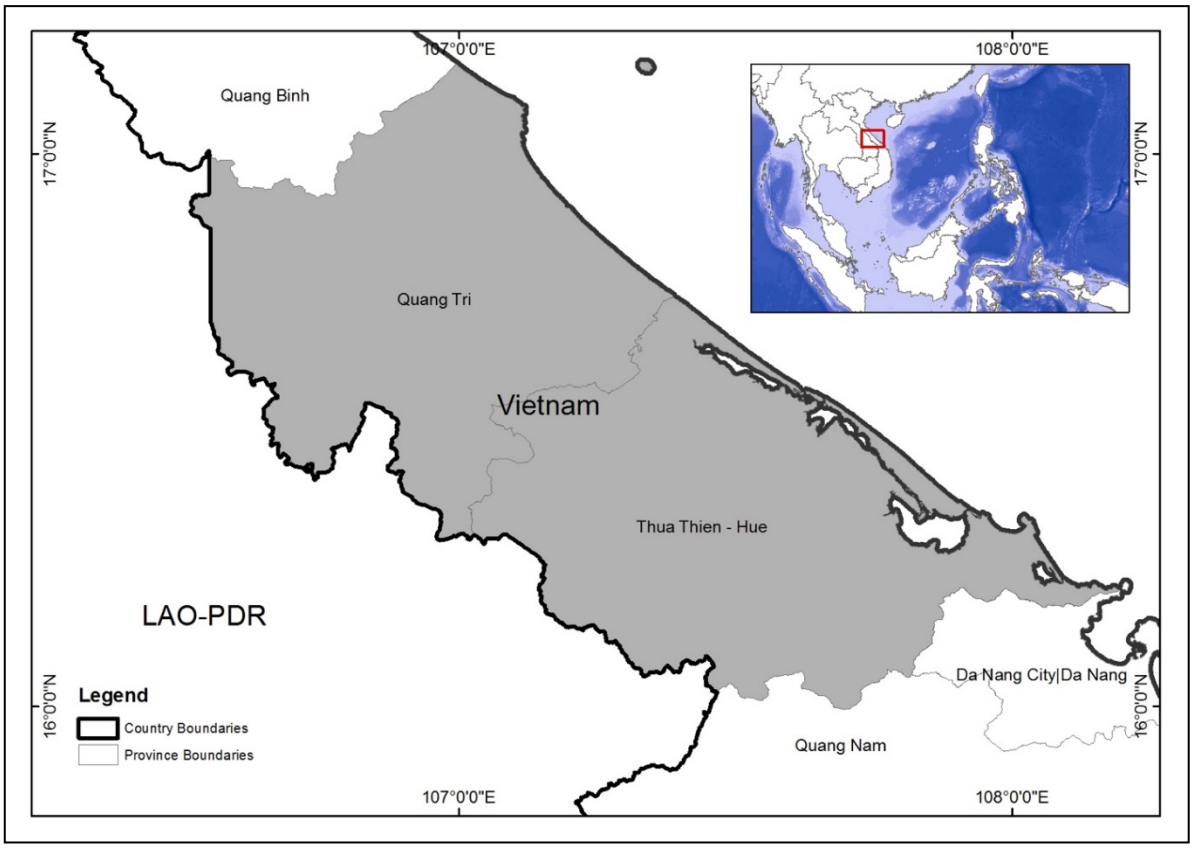
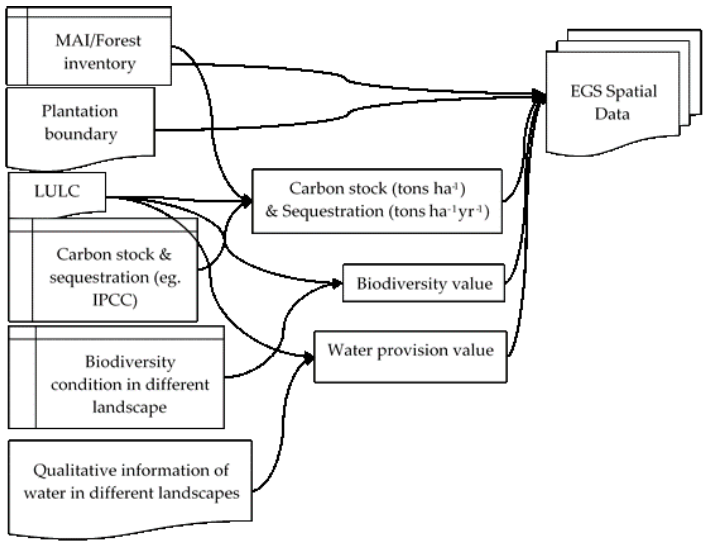


Figure 1. Map of study area: Quang Tri and Thua Thien – Hue Provinces in Central Viet Nam

The study used mixed qualitative and quantitative approaches. The connection between ecology and management, ecosystem benefits and approaches and tools for assessing ES is illustrated below (Figure 2).



The qualitative approach involved the description of the situation found in the secondary literature. Meanwhile, a simple equation was derived as a quantitative approach to assess and value the ecosystem benefits (timber and carbon components) resulting from planted

forests. The results were then mapped using the methodological framework shown below (Figure 2).

Carbon values for different land cover types were obtained from recent estimates undertaken for Viet Nam's forest reference level emissions assessment for reporting to the UNFCCC, the National Forest Inventory, Monitoring and Assessment Program (NFIMAP). Water yield and biodiversity components were assessed using a qualitative approach from published research, with results for biodiversity and water quantity on different landscapes from various sources, translated into scalar variables. Quantitative carbon data has higher accuracy, than biodiversity, water provision and erosion control qualitative valuation from recent literature in the region.

Table 5. Change in Land Use and Land Cover between 2005 – 2015 in Quang Tri and Thua Thien-Hue Provinces. The unit area is in hectares (ha), the percentage of the area is indicated in brackets

LULC Classes	Area (ha)				Change in area (ha)_	
	Quang Tri		Thua Thien - Hue		Quang Tri	Thua Thien - Hue
	2005	2015	2005	2015	2005-2015	2005-2015
Rich Forest	15,411 (3)	16,869 (4)	36,412 (7)	24,606 (5)	1.459 (%)	-11.805 (%)
Medium Forest	56,396 (12)	58,414 (12)	47,499 10)	51,860 (11)	2.018 (%)	4.362 (%)
Poor Forest	76,650 (16)	64,191 (14)	103,000 (21)	133,276 (27)	-12.459 (%)	30.276 (%)
Plantation forest	63,239 (13)	94,919 (20)	67,691 (14)	87,589 (18)	31.681 (%)	19.897 (%)
Non-forest land	262,421 (55)	239,723 (51)	237,046 (48)	194,316 (40)	-22.698 (%)	-42.730 (%)
Total land area	474,116	474,116	491,647	491,647		

5.3 Objective 3. Build a network for policy learning and capacity in plantation sector policy analysis, development and implementation in Lao PDR and Viet Nam

A policy learning network and capacity building for relevant research and analysis skills, were developed through the following activities.

5.3.1 Policy forums

'Plantation Policy Forums' were held each country. This was a new model of engagement with industry and community stakeholders and provided opportunities for identifying policy issues, testing different policy options and for learning about different policy approaches. related activities. We identified female participants and aimed for gender balance in engagement and training activities.

5.3.2 Research and practice networks

Research and practice networks were developed through:

- Researchers and policy staff from both countries visiting case study sites as part of the investigation and to build shared learning and understanding.
- Project participants from policy agencies and research groups in each country travelled to the partner country (Lao partners to Viet Nam and Viet Nam partners to Lao) for policy forums and Steering Committee meetings to share learning and ideas.
- Lao and Vietnamese partners participated in the New Generation Plantations Platform, and international conferences on planted forests to learn from others engaged in policy research and development.

5.3.3 Training workshops

Training conducted through the program included four formal workshops (two on policy and two on forest economics in each country). Field teams also received extensive training for livelihood data collection.

Training activities in policy research and stakeholder analysis were conducted in Vientiane on 21 March and Hanoi on 24 March 2016. About 15 participants from forest research institutes, government agencies and universities attended in each country. Participants indicated a high level of satisfaction with the content of the workshops. Workshop participants were able to apply the skills developed in these workshops to facilitate discussion and activities in the policy forums in each country the following day.

On June 18, 2018 in Hanoi 20 people from different GOV agencies (approximately 35% female) participated in training on forest resource economics. The training briefly introduced the concepts in forest economics and business models for moving from short-long rotation forest; tools used in evaluation of investment options, non-market services of forest resources and assessment of forest investment at enterprise or household level.

On June 20-22, 2018 in Vientiane, the project organized a training on Forest Economics for country partners. Thirty participants from NUoL; different government agencies; companies and NGOs attended. The training introduced the concept of forest resource economics; assessment of forest investment enterprise or household level; economy wide assessment of forest investment and household level analysis. Approximately 82% of the participants thought that the knowledge on forest economics from the training was useful for their work, and 80% of them felt the quality of training was very good. The participants suggest that this training should be organized at sub-national levels where investors and harvesting entities are located. They also noted that understanding on plantations policies prior to training was beneficial.

Project partner employees and collaborators (approximately 20 people) were trained in semi-structured interview and household survey techniques and have been able to use these skills to interview key stakeholders and carry out field research.

5.3.4 Postgraduate training

A PhD candidate based at ANU (Alex van der Meer Simo) worked on household-level impacts of alternative plantation development models in Lao PDR.

Masters students from the University of Melbourne and ANU were involved with the project and produced theses or research reports.

For details on contributions see Section 7.3.4

6 Achievements against activities and outputs/milestones

Objective 1: To develop policy and institutional options for plantation development

Activities	Outputs/ milestones	Completion Date	Comments
1.1 Communication and engagement activities for project design, implementation and impact	Project inception and steering group meetings Project advisory group meetings	Project Planning Meeting held in VTE, Nov 2015 Two policy forums held in VTE and Hanoi, March 2016 Two policy forums and Project Advisory Group Meetings held in VTE and Hanoi, March 2017 Two policy forums and Project Advisory Group Meetings held in VTE and Hanoi, June 2018 Steering Committee Meetings were held in: Hue, Viet Nam Jan 2017 Luang Prabang in Dec 2017 Da Nang Dec 2018	Policy forums in each country provided a platform for policy makers, practitioners and industry to discuss issues faced by plantations and consider potential policy solutions. Results of these discussions were used to generate final project outputs Forum reports were posted on the project website. https://Lao PDR-vietplantation.org/

Activities	Outputs/ milestones	Completion Date	Comments
1.2 Analysis of context, institutional processes and organisational structures for plantation development.	Report on context and institutional aspects of plantation development. Presentations to key policy makers and to Plantation Policy Forum. Policy briefs	Two policy frameworks documents one each for Lao and Viet Nam were completed and presented to key stakeholders in February 2017. Stakeholders interviews were conducted. Presentations made at policy forums on the dates above Eight draft policy briefs were produced and presented to policy makers at the Policy Forums in June 2018. Three were revised on the basis of these discussions.	Comprehensive frameworks for each country are available online. A shorter synthesis was also produced. Smith, Barney, K, Byron, N, Simo, A. Phimmavong, S., Keenan, R.J. 2016. Tree Plantations in Lao PDR: Policy Framework and Review. Project Working Paper 1. ACIAR Project FST/2014/047, Improving policies for forest plantations to balance smallholder, industry and environmental needs. Smith, H, Barney, K, Byron, N, Tran, D. N, Keenan, R.J., Vu T.P. and Huynh, T. 2017. Tree Plantations in Viet Nam: A Policy Framework. Project Working Paper 2. ACIAR Project FST/2014/047, Improving policies for forest plantations to balance smallholder, industry and environmental needs.
1.3 Supply chain analysis for plantation industry.	Report on supply chains for example for (i) woodchips and furniture in Viet Nam; (ii) Eucalyptus furniture production in Lao and (iii) teak production in Lao.	Paper on supply chains for Viet Nam completed and published in 2017: Paper on supply chain for teak in Lao PDR completed and published in 2018 .	Maraseni, T. N., Son, H. L., Cockfield, G., Duy, H. V., & Nghia, T. D. 2017. The financial benefits of forest certification: Case studies of acacia growers and a furniture company in Central Viet Nam. Land Use Policy, 69(Supplement C), 56-63. Maraseni, T.N., Phimmavong, S., Keenan, R.J., Vongkhamsao, V., Cockfield, G., Smith, H., 2018. Financial returns for different actors in a teak timber value chain in Paklay District, Lao PDR. Land Use Policy 75, 145-154.

1.4 Analysis of environmental management and protection measures for plantations and standards for certification of plantation products	Report on policy to support improved environmental outcomes of plantation development. Presentation of outputs.	Working papers on Environmental Management and Protection Measures for Lao PDR and Viet Nam were completed in 2017	Smith, H., E. Carmichael, R. Keenan, P.Kanowski, C. Phompila, A. van der Meer Simo 2017. Tree Plantations in Lao PDR: Environmental management and protection measures. Working Paper 3. ACIAR Project FST/2014/047, Improving policies for forest plantations to balance smallholder, industry and environmental needs. Smith, H., Ha, N., Tran, D. N., Phuong, V. T. and Kanowski, P 2017. Tree Plantations in Viet Nam: Environmental management and protection measures. Working Paper 4. ACIAR Project FST/2014/047, Improving policies for forest plantations to balance smallholder, industry and environmental needs.
1.5 Development and analysis and recommendations on alternative plantation policies.	Integrated reports on plantation policies for Viet Nam and Lao PDR in terms of national goals, increasing product value, societal impacts, increasing benefits market flexibility and increasing social capital and policy recommendations	Reports on policy options completed and presented to Steering Committee in December 2018.	Published as Report for Final Workshop. Improving policies for forest plantations to balance smallholder, industry and environmental needs in Lao PDR and Viet Nam. December 2018.

Objective 2: To understand the positive and negative social, economic and environmental impacts of different tree plantation development approaches

Activities	Outputs/ milestones	Completion Date	Comments
2.1 Data collection and analysis of household level social, human and financial capital and community livelihood strategies at 5 sites.	Analysis and interim report for 2 sites (one in each country). Final report comparing five different plantation development approaches.	Summary report prepared for Steering Committee Journal paper completed: Van Der Meer Simo A, Kanowski P and Barney K. (2018) Revealing environmental income in rural livelihoods: evidence from four villages in Lao PDR. *Forests, Trees and Livelihoods*: 1-18. Final reports on project website as: Barney K. and A. van der Meer Simo 2019. Forest Plantations and Smallholder Livelihoods: Evidence from Community Case Studies in Lao PDR. Working Paper 5. Huynh T-B and Keenan RJ. 2019. Forest Plantations and Smallholder Livelihoods: Evidence from Central Region of Viet Nam. Project Working Paper 6.	Further journal papers are being prepared from this work

2.2 Analysis of larger-scale industry or small-scale investor returns and risks at 5 sites.	Analysis and interim report for 2 sites (one in each country). Final report comparing five different plantation development approaches in terms of industry and smallholder returns	Paper completed for Viet Nam sites and published as Maraseni TN, Son HL, Cockfield G, Duy HV, Nghia TD. 2017. Comparing the financial returns from acacia plantations with different plantation densities and rotation ages in Viet Nam. Forest Policy and Economics. 83:80-87. Paper revised for Lao site and submitted to the journal Land Use Policy February 2019 as: Phimmavong, S, Maraseni, T, Keenan, RJ, and Cockfield, G. Comparing financial returns from three Eucalyptus plantations in Lao PDR	
2.3 Analysis of economy wide effects of plantation development	Report on economy wide effects of plantation development at 2 sites, 1 in Lao PDR and 1 in Viet Nam.	Reports completed and presented to Steering Committee in December 2018 Published as Report for Final Workshop. Improving policies for forest plantations to balance smallholder, industry and environmental needs in Lao PDR and Viet Nam. December 2018.	These interim reports will be developed further and presented for publication as journal papers.

2.4 Analysis of natural capital and environmental benefits and impacts.	Report environmental benefits and impacts of plantation development in Lao PDR and Viet Nam and potential trade-offs between the production of different goods and services.	Framework paper completed in December 2016 and published as: Baral H, Guariguata MR, Keenan RJ. 2016. A proposed framework for assessing ecosystem goods and services from planted forests. Ecosystem Services. 22:260-268. Paper submitted to the journal Forests Samsudin, YB, B. Okarda, K Paudyal, H Baral, SK,Poudel VT Phuong and RJ Keenan Spatial assessment of ecosystem services from planted forests in Central Viet Nam	.

Objective 3. To create a network for policy learning that builds capacity in plantation sector policy analysis, development and implementation

Activities	Outputs/ milestones	Completion Date	Comments
3.1 Training workshop in policy analysis in Lao PDR (PC).	Workshop report.	Completed in March 2016 in Vientiane and March 2017 in Viet Nam.	Workshop reports submitted in July 2016 and July 2017
3.2 Training workshop in economic analysis in Viet Nam (PC).	Workshop report.	Completed in June 2018 in Hanoi and Vientiane	Workshop report submitted in July 2018
3.3 Study tour and workshop on plantation governance in Thailand.	Workshop report.	Completed	This was replaced with travel to the International Congress on Planted Forests in Beijing and a field visit to Southern China.
3.3 Project website development (A).	Project web-site established. Reports and materials on project website.	Design developed and deployed in March 2017.	
3.4 Meetings of Plantation Policy Forums in Lao PDR and Viet Nam (PC).	Annual meetings and reports.	Policy forums held in Lao PDR and Viet Nam in March 2016, March 2017 and June 2018	

3.5 Steering Committee and meeting of country Project Advisory Groups in Lao PDR and Viet Nam (PC).	Annual meeting reports of Steering Committee Six-monthly meetings of PAGs in each country.	Steering Committee meetings were held in Steering Committee Meetings were held in: Hue, Viet Nam Jan 2017 Luang Prabang in Dec 2017 Da Nang Dec 2018	2017 SC Meeting report. PAGs meeting report integrated in the Policy Forum reports
3.6 Presentations and conferences and engagement with related initiative.	Presentation at New Generation Plantations Forum. Presentation at international dialogues.	Project organised meeting organised with other working on plantation policy in Lao PDR in March 2018	Report attached.

PC = partner country, A = Australia

7 Key results and discussion

7.1 Objective 1. Develop policy and institutional options for plantation development

7.1.1 Context Analysis, Institutional Processes and Organisational Structures

Viet Nam

Analysis of policy settings and organisational arrangements indicated that Viet Nam has set an ambitious national policy goal to become an upper-middle income country by 2035 based on balancing economic prosperity with environmental sustainability, promoting equity and social inclusion and enhancing the capacity and accountability of the state. This goal is supported by forest sector strategies that increase the economic contribution of the sector through restructuring state enterprises, developing functioning land markets, increasing participation in global value chains, fostering innovation, internalisation of environmental costs and building climate resilience. Analysis revealed a comprehensive legal framework with 40 laws, decrees and decisions relating to forest plantations and eight national government agencies and many provincial government agencies responsible for administering this regulatory framework and providing a supporting environment. Past and current policies have been broadly successful, plantations have contributed substantially to past targets for increasing forest cover and they provide a range of environmental services (e.g. carbon sequestration, soil and catchment protection) but are not a full substitute for natural forests.

Opportunities to expand plantations are becoming limited because of demand for land for agriculture, infrastructure and urban development. Current plantations managed on short rotations supply volatile markets - woodchips for pulpwood. Depending on land regulations and policy incentives, growers of short rotation plantations may shift to other agricultural commodities. Forest area provided by plantations may therefore not be permanent.

Export market requirements have driven new policies for timber legality and sustainable forest management in Viet Nam, and in export markets, and have reduced imports of natural forest wood. New policies for harvesting and conversion of natural forest, and for strong and growing wood industries may increase demand for wood the future. Increased domestic timber production needs to come from sustainably managed sources including plantations. Current requirements to demonstrate legality and sustainability through certification can impose high costs on smallholder growers and have had limited uptake.

There are relatively few tree species grown in plantations in Viet Nam. This is advantageous for meeting current market and for focusing research for tree improvement and silviculture to improve production. However, low species diversity may make plantations more susceptible to pests, diseases, fire or climate change.

Current timber production by smallholders involves high stocking and short rotations that produce limited amounts of saw logs for higher value furniture markets. Trees grown on lower stocking or longer rotation systems could replace timber sourced from natural forests in Viet Nam or imported from elsewhere.

Semi-processed woodchips sold into international markets currently provide a good return to tree growers and exporters but have lower potential benefits to the wider Viet Nam economy. Policies to promote production by smallholders of larger logs are challenged by farmer decisions on risks and returns. Different growers have different income and management goals. Perception of risk of losses from typhoon, fire, insects or disease may be as important as the actual risks. The production of larger wood requires investment in

new machinery for harvesting, loading and transport. Maximum economic benefits from tree growing requires, markets for woodchips and smaller logs. Parts of the plantation area are also not suitable for long-rotation production.

National policies aim to support poverty alleviation and expand agricultural, forestry, fishery activities and extension services to improve livelihoods of poor people. For example, the Forestry Development Strategy 2006-2020 aims to contribute to poverty alleviation, improve livelihood of mountainous rural people and to maintain national security. Poor households are allocated land and entitled to receive low interest loans for forest plantations. Data from this project indicates that forest plantations have contributed to economic development but less to reducing poverty. Generally, across communities, livelihoods and wellbeing have improved as a result of plantation development, but the poorest groups have not benefitted as much, and their asset base may be inadequate, unstable and risky.

Lao PDR

Analysis of policies, institutions and organisations indicated that Lao PDR has transformed through development over time, from the pre-colonial and colonial eras through the Indo-China war period, to independence in 1975, and as a result of increasing exposure to regional and global trends and opportunities. These trends are reflected in past and current policies which have also been influenced by and linked to the receipt of development assistance, and therefore to motivations of donor countries and organisations. Policy also reflects the overt or, sometimes hidden, motivations of the policy makers and their complex internal relations as well as with neighbouring countries.

Forest policy in Lao PDR has evolved from an initial focus on subsistence use and local trade in forest products, to poverty alleviation via forest land allocation to villages and households and subsequently increased industrial development based on exploitation of natural forests and government revenue from log exports. More recently there has been a focus on forest conservation. Tree plantation policy has similarly followed this path of supporting contributions to local livelihoods through to industrial development via foreign investment and landscape level restoration.

The Forestry Strategy 2020 (FS2020) is the primary sectoral strategy for forestry, including plantations. It was initiated as one of the policy dialogue activities at the 7th United Nations Interagency Round Table Meeting in September 2000. The objectives of this strategy are capacity building, reducing the deterioration of forest resources, development and enforcement of laws and regulations, sustainable management of production forests, promotion of commercial tree planting by individuals, groups, organizations, small and medium scale companies and foreign and national investors, sustainable wood supply and domestic processing, forest ecosystem and soil and water conservation, effective use of forest revenue, and sustainable management of non-timber forest products. It includes a target to restore the extent and improve the quality of the forest estate through supporting natural regeneration of 6 million hectares of forest and establishing 0.5 million hectares of tree plantations on unstocked forest areas.

The Five-year Agriculture and Forestry Development Plan (2016-2020) supports certification of production from native forests, village forest development, procedures for sale of forest carbon credits and the development of improved regulations, rules and strategies for forests.

Strategies on National Growth and Poverty Eradication, Environment, Land, Agricultural Development, Exports, Climate Change and Biodiversity also impact on forest and tree plantation management.

Many of the forest and broader development related strategies are underpinned by target-driven indicators that may send a clear signal of commitment, but which may not be particularly useful in understanding policy effectiveness or in pointing to areas that need reform. For example, the plantation area target has become a key indicator of success but

this provides little indication of whether policies for plantation development are achieving their desired objectives.

7.1.2 Supply chain analyses

In Viet Nam, a study based on costs and returns from a State Forest Enterprise indicated that returns from longer (10-year) rotation Acacia tree plantations at lower density (1650 stems/ha) that produce both sawlogs and woodchips are greater than shorter (5-year, 2500 stems/ha) rotations that produce just woodchips. This is the case whether assessed on an NPV, IRR or Annual Equivalent Value basis. Increasing the rotation length could have benefits for the furniture industry in providing sustainable local wood supply, increase national economic output and increase grower returns in the long-run.

However, smallholder growers currently prefer shorter rotations because they require income quickly and they are concerned about risks of damage from typhoons, insect pests or diseases. Financial incentives, credit, marketing, and advisory support would encourage more growers to transition from short to long rotation Acacia. Support for nurseries and demonstration plots are important. In some cases, land tenure insecurity makes it difficult for forest owners to make long term plans or to receive finance.

To support lower income households to grow trees over the longer growing period requires: partnerships among growers and processors to create genuine value chains; support to manage risks from natural disasters (e.g. compensation or insurance schemes); financial support (grants or low interest loans for longer rotations); secondary markets for smallholders to forward-sell trees to sawmillers or processors.

Forest certification can demonstrate sustainability of wood supply. A study of an Acacia supply chain in Viet Nam indicated that certification may increase the return on a portion of the product for growers and provide higher market prices for processors. Growers bear most of the costs of certification, but the processors get most benefits. Growers cooperatives can reduce costs for individual growers. A minimum area of 3000 ha is required to reduce costs and encourage certification.

Study of a teak value chain in Paklay District, Xayaboury Province Lao PDR, indicates that supply of teak logs for furniture manufacturing supports profits for growers (US$ 8.4 to US$ 23.3/m^3 of final product), middlemen (US$4.7/$m^3$ of final product) and the processor (US$171/$m^3$ of final product).

Most profits are made by the processor. Regulatory costs represent 39% of the costs of harvest and transport. Changes that can increase overall, and individual, benefits include: (1) For growers: improved seedling quality and improved plantation management that improve log quality; (2) For middlemen or traders: reduced costs of regulation and approval; and (3) For the processor: improved log quality and recovery, more diversified market.

In both Lao PDR and Viet Nam, there are poor relationships within supply chains. Increased information along, and collaboration along the supply chain (that is, creating a value chain) could increase total product output and efficiency.

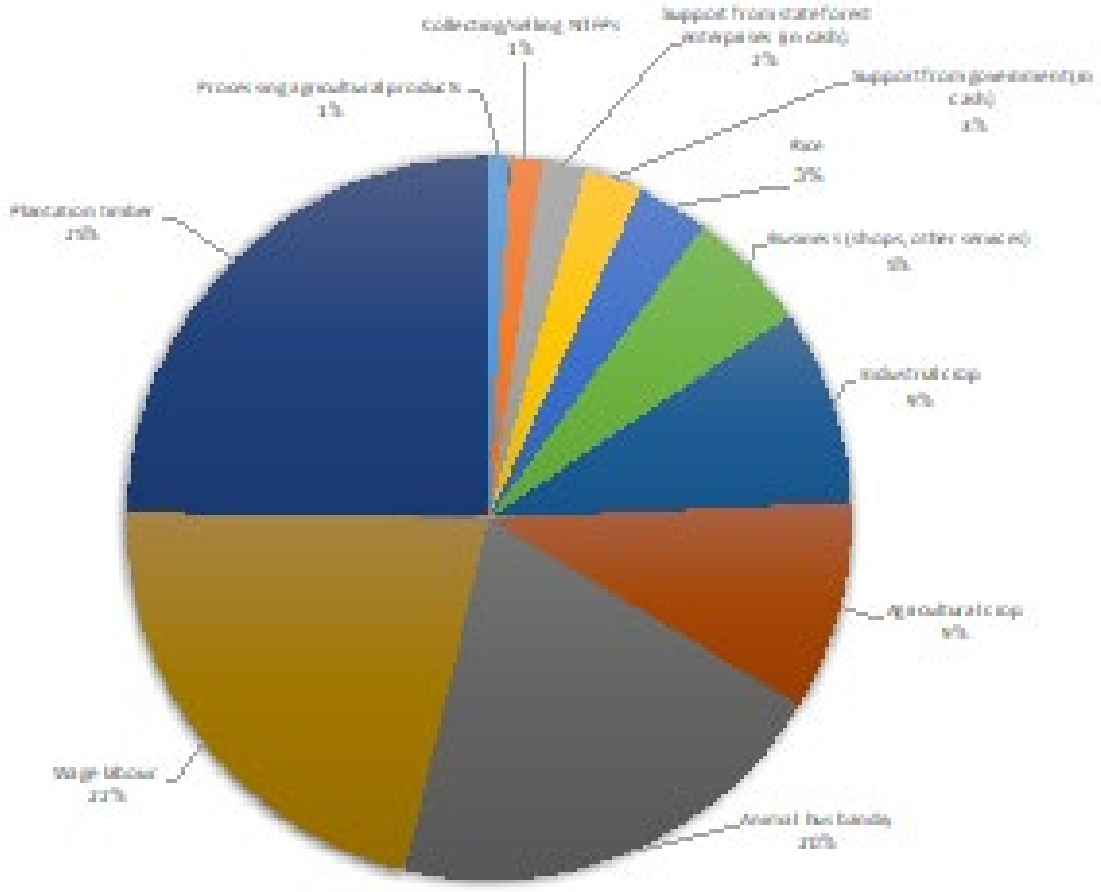
Traders play an important role in the supply chain, especially for growers. There is a need to support the roles and skills of middlemen and traders and reduce the cost of government regulation and compliance.

7.1.3 Analysis of alternative policies – Viet Nam

Poverty alleviation and land allocation conflicts

Smallholder forest plantations have positive impacts on livelihoods and wellbeing, including financial and income benefits, social status, psychological benefits such as self-esteem and ability to positively influence other community members. Timber sales and plantation wage labour were the top two income sources for local households, providing on average of 25%

and and 22% respectively, of total household income. However, the distribution of land amongst households is uneven. Poor, or new, migrants have smaller areas, which means that the benefits of commercial tree growing are skewed to larger landowners.



Under the Forest Land Allocation program, there was initially limited interest from smallholders in acquiring land for plantations. Some 'early adopters' were able to acquire significant areas (>10 ha) of plantation land. As markets have developed, the profitability of plantations has created a strong demand for land. This is leading to increased conflict as State Forest Enterprises seek to maintain their productive and profitable plantation base while households demand more land to grow trees.

Income group	Annual Incomes (USD)	Forest area (ha)	Percentage of total surveyed HHs
Low	1,790	1.9	19%
Medium	4,050	3.2	37%
Medium-High	7,390	3.6	33%
High	18,900	7.9	11%

Table 7: Income and Land Area in Surveyed HHs in Quang Tri and Thua Thien Hue provinces.

Those who have been allocated plantation land have improved incomes and social capital (i.e. enriched knowledge base and network exchange among community members) but other dimensions of poverty (i.e. vulnerability, agency and power) are still apparent, particularly for those with smaller land areas (<2 ha). Partnerships between smallholders, state enterprises, and the timber industry can realize Government poverty alleviation goals for plantations. Enduring partnerships built on genuine collaboration and equitable sharing of benefits can promote vertical and horizonal linkages in the timber value chain. However, eroded trust, lack of transparency and accountability, and poor communications are key barriers to these partnerships.

"…It is impossible to reallocate much of SFCs' land to HHs. We need to ensure sources of material for woodchip production. Further encroachment and reallocation of SFCs land to villagers will cause serious damage to the provincial land use planning…". Vice Chairman of Quang Tri Provincial People's Committee[1]

"Even if all SFCs land is reallocated to HHs, this is insufficient due to the population growth and the increase in the nuclear families" – Hue Forest Protection Department[2]

Strengthening accountability and transparency, and trust in institutions is crucial. Mass organizations (such as the Women's Union, Youth Farmers Association) are important institutions with extensive networks at the local level. It is recommended that capacity development and mechanisms to allow these organizations to effectively assist with land governance, conflict resolution, and supporting smallholder engagement with timber markets and value chains need to be in place. For example, Hue province has already embarked on working with mass organizations in handling conflicts from land allocation and use. Lessons from these models should be shared. Giving access to data and information is important for increasing accountability.

Finance and human resources, allocated to planning, implementing and monitoring land allocation are not adequate, especially at local level. Despite the Circular 38 stipulating involvement of local communities in decision-making processes on forestland allocation

[1] *Provincial People's Committee Portal, https://www.quangtri.gov.vn/portal/Pages/default.aspx. Accessed June 2018*

[2] *Project Interview*

(FLA), this study found that there is still a lack of participation of smallholders in FLA allocation processes. The absence of transparency and grievance mechanisms around FLA has contributed to eroding trust and causing conflicts between smallholders, state forest enterprises and local authorities.

Access to bank loans is important for smallholders' investment decisions. However, limited number of HHs have access to or are interested in formal bank loans, due to the complex processes, high transaction costs and interest rates, and their ability to repay the loans.

Knowledge exchange (via both formal and informal channels) was identified as one of the key livelihood improvement strategies associated with plantations. Despite the volume and frequency of training provided to some communities, these activities were regarded as repetitive with too much focus on silviculture. Survey participants recommended that training focus on more practical content such as harvesting and management, financial management, product marketing. There were also concerns expressed about seedlings quality and pest and disease detection and management.

Lower income HHs are often hesitant to engage in formal credit programs or bank loans due to complex procedures. Improved ability of poorer households to access formal credit could facilitate their ability to invest in tree plantations or facilitate different plantation management options.

Policy recommendations - Poverty alleviation and land allocation conflicts

In the short-term (next 3 years):

1. Increase resources and capacity to accelerate local-level forest land allocation and actively involve smallholders in seeking solutions to land use planning at local levels and to plan, implement and monitor forest management.
2. Ensure that allocated land area and quality are enough to provide adequate income and options for future production. A minimum of 4-5 ha is required to ensure enough income for households to escape poverty.
3. Establish processes and resources for managing land disputes and grievance mechanisms that This will build trust and collaboration between local people and governments.
4. Support mass organizations with mandates and capacity building to deal with land processes and conflict management.
5. Support training and networks to build stronger asset bases and greater capacity in poor households to manage plantations and produce higher value wood. These should be targeted at new immigrants or ethnic minorities in more remote areas and include mechanisms for peer-learning, and information sharing amongst value chain stakeholders. Support can include use of high-quality planting material, the implications of different cropping decisions, financial literacy, accessing market information, and negotiating contracts.

Higher-value log production

In Viet Nam policies have generally been effective in meeting broad socio-economic development objectives for forests and plantations - preventing further loss and increasing natural forest cover, improving farmer incomes, and providing export income from woodchips and furniture. However, some of these policies have had broader consequences, including increased dependence on wood imports that may be contributing to deforestation elsewhere.

Taxes, such as woodchip export taxes, intended to change markets and encourage a shift to solid wood products and furniture production have been ineffective in driving change to longer rotations because the effects are not directly felt by smallholder growers. The current varieties of plantation grown wood are limited and may not be suitable for sawlog production or meet some market requirements, particularly where these are replacing timber sourced from natural forests in Viet Nam or imported from elsewhere.

Growing short rotation plantations for woodchip in Central Viet Nam is highly profitable for smallholder growers. A rapid shift away from short rotation production may have adverse consequences for risk-averse small growers. The impact of policies intended to encourage farmer to extend rotation lengths, such as low interest loans may be constrained by caution due past experiences.

Managing plantations on longer rotations can provide more benefits to smallholders (due to lower costs and higher prices for larger logs), but the returns take longer to realise (Table 8). State Forest Enterprises and some households with larger land areas are aware of the benefits and grow logs on longer rotation. There are potentially higher risks of losses due to typhoons or disease, but there is little hard information on the risks and impacts of these events.

Financial indicators	5 year rotation		6 year rotation		10 year rotation	
	7% DR	12% DR	7% DR	12% DR	7% DR	12% DR
Net Present Value, NPV (US$/ha)	1,148	762	1802	1,222	4,865	2,972
Benefit Cost Ratio (BCR)	1.51	1.37	1.80	1.61	2.82	2.39
Internal Rate of Return (IRR)	27%	27%	31%	31%	33%	33%
Annual Equivalent Value (AEV) (US$/ha)	280	211	378	297	693	526

Note: AEV is annual equivalent value, discounted NPV of investment. DR is discount rate (Maraseni *et al*., 2017b)

Table 8: Financial returns from three different density and rotation age of acacia plantations

In interviews with 100 households in four villages in Thua-Thien Hue Province, some high-income HHs have diversified production to include longer-term plantations, but many were at best only moderately interested in long rotations. They were aware of the potential higher returns, but their decisions were influenced by their available resources, access to support and perception of risks. Recent events can also influence preferences. For example, Typhoon No. 10 (Sept. 2017) caused significant damage to property, especially plantation and infrastructure. More than 3,500 hectares of plantations were affected, with damage to more than 50% of trees in the plantations.

Barriers to smallholders producing larger and higher quality log product are:

1. grower needs for short-term cash flow,
2. low price difference between sawlogs and woodchips,
3. perceived risks of storms and disease from growing trees longer to larger size,
4. lack of information on silvicultural requirements for larger log production (initial spacing).
5. lack of information flow between processors and growers on price and quality for different log sizes,
6. group pressure to sell all timber at once from an area,
7. the costs of harvesting larger logs and
8. the lack of incentive for traders to promote and engage in the sale of larger logs.

Good quality seedlings are available from state-owned forest companies or research centres, but smallholders tend to use local and private nurseries due to the proximity, social relationships and lower price.

Given the financial drivers for smallholders to cut trees at an early age, regulation to encourage growers to produce larger logs are likely to be ineffective. The most effective policy measures are likely to be incentives and education programs that reward growers for managing on longer rotations and providing education about the benefits and how to manage longer rotations. Assessing risk management options is also important.

Policy recommendations - higher-value log production

In the short-term (1-3 years)

1. Implement a pilot program to provide grants or conditional loans to smallholders to convert from short to long rotation plantations. This would provide a payment at year 4 or 5, when a grower might normally plan to cut trees. Further research is required to determine the level of payment to growers required for them to change their plantation management.
2. Support networks in wood value chains for information flow and to identify opportunities for all actors to benefit from increased value, for example the successful partnership in Hue Province between Scania and growers
3. Build capacity for forest extension on larger log production in agricultural cooperative programs, particularly trained/specialized staff to take immediate actions and responses to pest management at local level
4. Facilitate access by smallholders to new and high-quality seedlings (timely technology transfer) assist with quality assurance or certification of these local nurseries.
5. Support smallholders to organise collective harvesting of long-rotation plantations
6. Assess options for managing risks in longer rotation plantations due to storms or disease losses eg. insurance, government or industry underwriting, disaster risk compensation funds for value losses

In the longer-term (3 years plus):

7. Expand incentives to increase carbon stock in longer rotation plantations by extending Payment for Forest Environmental Services (the Forest Protection Fund) contributions to fossil fuel energy generators. These incentives would reward forest growers for increased carbon stock associated with longer rotation plantations.

Environmental values and ecosystem services

The effect of plantation management depends on the land use the plantations replace and management practices such as site preparation (particularly the use of fire) and log harvest and transport. Viet Nam has comprehensive but fragmented regulatory arrangements governing environmental aspects of plantations. Planning for environmental protection occurs at National and Provincial levels, by MONRE and provincial People's Committees, considering broader socio-economic development plans and objectives. The Law on Environmental Protection 2014 prohibits all activities that destroy or damage forests. Specific measures to minimize and mitigate the negative social, economic and environmental impacts of tree plantation development are articulated in Law, regulations and guidelines. EIAs are required for plantations over a certain scale. In practice, the EIA system is highly decentralized. EIAs for small projects can be approved at the provincial level, and central ministries have limited leverage.

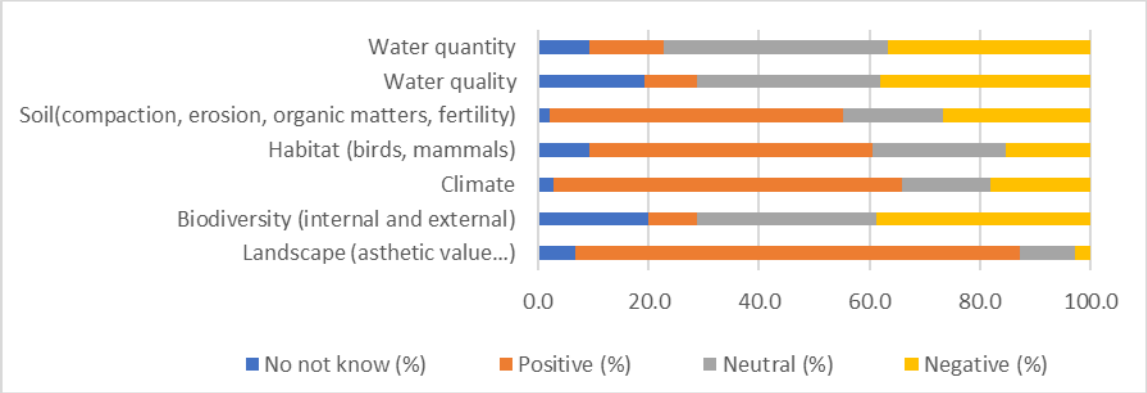


Figure 3: Villager perceptions of plantations effects on environmental values in Quang Tri and Thua Thien Hue Provinces.

Villagers generally have a positive view of impact of plantations on their environment (Figure 3). However, environmental regulations covering plantations are often considered unrealistic and contradictory. They lack clarity, rules are considered unreasonable and complex, and come with high real and hidden transaction costs that may exacerbate non-compliance. Project studies showed that barriers to achieving and demonstrating the environmental credentials of plantation wood are:

- poor understanding and limited enforcement of current planning rules for slope and stream protection,
- lack of regional/provincial objectives for high conservation natural forests,
- limited monitoring of environmental impacts of plantations,
- landowners and policy makers are not aware of the value of environmental services from plantations,
- high costs of forest certification for growers (planning and auditing),
- uncertain returns from selling certified wood
- uneven distribution of benefits of certification along the supply chain, and
- low participation in group certification due to cost to growers, loss of market flexibility

Environmental outcomes from plantations, and from natural forests can be improved through enforcing existing laws, zoning land for plantation development, national standards and codes of practice for timber production, through forest certification schemes, and through payments for ecosystem services. These can be supported by building capacity through education and training.

While there are impacts of plantation on some aspects of soil and water due to harvesting or site preparation practices, studies in this project indicate that when replacing non-forest, planted forests can increase the supply of ecosystem services. The extent of change depends on the change in forest cover and management practices in planted forests. In a study in Thua-Tien Hue and Quang Tri provinces, conversion of 52,000 ha of non-forest to planted forest between 2005 and 2015 (a 39% increase) resulted in an increase in carbon stock of 1.6 million tonnes in planted forests and improvement in water quality, reduced sediment loss and biodiversity habitat. However, at a landscape scale, these carbon gains were offset by loss of carbon stock in natural forests of about 2.5 million tonnes due to the conversion of rich forest to medium or poor forests.

Policy recommendations - environmental values and ecosystem services

In the short-term (3 years plus)

1. Develop a code of practice for forest plantations with training and education programs for provincial and district staff, forest growers, SFEs, harvesters and traders
2. Support farmer-based, cooperative certification programs, for example through agricultural grower cooperatives

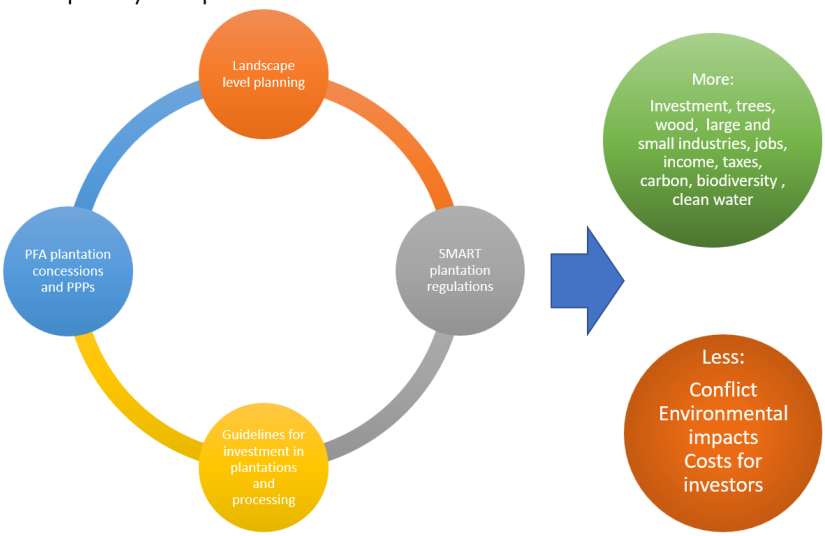
In the long-term (3 years plus):

3. Develop a monitoring system for assessing environmental services from forest plantations, including impacts on carbon, water, soil and biodiversity habitat
4. Assess a levy on processors who receive chain of custody certificates to fund support for smallholder certification

7.1.4 Analysis of alternative policy options Lao PDR

Policy findings from the project for Lao PDR are summarised in four themes: landscape-level planning, plantation regulations, foreign private investment, and plantation development in Production Forest Areas (Figure 4 and Table 9). Evidence for these findings and recommendations comes from an analysis of current laws, regulations and policies; interviews and discussions with policy makers, industry actors, and investors; social research on the benefits of plantation investment for communities; studies of investment outcomes and supply chains; and regional economic analysis. Details of this research are reported in the series of reports and briefs.

Figure 4. Lao PDR policy outputs



Key points

Plantations in Lao PDR have good economic potential, but this potential will only be realised and sustained through planning, promotion and partnerships.

Interviews with policy makers and investors identified a need to agree on strategic investment zones for tree plantations and processing to guide private and government investment.

Local land use planning is generally not well coordinated or inclusive, and the principles for land allocation to plantations between corporate investors and smallholder plantations are not clear.

Regulations for establishment, management and harvesting of plantation wood are largely based on control mechanisms for natural forests. While there has been some reform for plantation wood, there are still high regulatory and transaction costs associated with establishing and harvesting forest plantations.

The interaction and coordination between levels of government and different government agencies responsible for plantations and processing is weak and inconsistent.

The current lack of a clear policy covering plantation development creates uncertainty for all investors.

Relevant extension and advice for smallholder tree growers are limited and outdated. Recent research can support the development of new extension material.

Independent certification is challenging and costly, especially for smallholders, and gives limited market benefit to smallholders.

There is lack of monitoring of the environmental impacts of plantations.

The investment procedures for foreign investment in plantations haves been uncertain; they are complex and inconsistent, and government agencies largely act as a gatekeeper and fee collector rather than facilitating investment in a partnership arrangement.

Tree and forest plantation investment can be an effective vehicle for partnerships between government, industry, investors and the community.

Production Forest Areas have been degraded through poor management, overexploitation and encroachment by shifting cultivation. Integrating tree plantations into PFAs in ways that deliver environmental and social benefits can contribute to forest restoration goals.

Different models of plantation development and benefit sharing have delivered different levels of financial return to local communities. The livelihood benefits from plantations can be positive, but safeguards are needed to protect local interests and avoid adverse outcomes. These safeguards include ensuring proper consultation with all members and informed consent from communities, equitable lease and village development fund payments, equitable access to employment and other benefits and minimising the impacts plantation development on water, roads and other values.

Table 9. Policy themes and issues, goals, options and recommendations for the forest plantation sector in Lao PDR. Revised after consultation with Project Steering Committee in Da Nang Dec 2018.

Theme and key issues	Goal	Policy options	Policy recommendations
1. Land information, planning and allocation			
There is a need to identify strategic investment zones for tree plantations and processing to guide private and government investment.	Agreement on the best places for plantations based on land-information (forest cover and condition, productivity, soils, slopes), infrastructure and potential markets.	Undertake a master planning process to identify strategic forest plantation investment zones. Ensure this process is consistent with NSEDP and recognised in the land allocation master plan. Ensure accurate and up-to-date information is available on forest cover, infrastructure and tenure.	R1. Build from current plans and processes to Identify strategic forest plantation investment zones, through a well-informed master planning process that engages key government, investor and community stakeholders. R2. In this context, develop and implement landscape-scale land use planning and allocation processes are inclusive, follow established principles (e.g. of Free Prior and Informed Consent; FAO Principles and Voluntary Guidelines on Planted Forests), and best practices (eg as practiced by some companies).
Local land use planning is generally not well coordinated or inclusive.	The areas best-suited to plantation development are identified within strategic investment zones and local communities' interests and potential alternative land uses are respected.	Undertake a 'landscape level' and inclusive approach to planning within strategic zones. Build on positive experiences from companies and projects to develop guidelines for local land use planning & allocation that includes local communities' interests and preferences.	R3. For the specific case of planning and approving plantation establishment in degraded PFAs, follow Recommendation 2 with particular attention to addressing local communities' interests and rights, allowing different scales and forms of investment, and ensuring environmental and social benefits, including through forest and landscape restoration in conjunction with plantation establishment.

Theme and key issues	Goal	Policy options	Policy recommendations
Principles for land allocation between corporate and smallholder plantations are not clear.	Clear and secure rights to establish forest plantations and sell and harvest wood are allocated to each of corporate growers and to villages and smallholders.	▪ Develop rules for land allocation for plantations that incorporate local needs and company needs for secure timber resources. ▪ Ensure that benefits of plantations are widely shared and build community capacity to produce timber. ▪ Integrate Village Land, Village Use Forests and the restoration of degraded forest lands into the planning process	R4. Identify mutually-beneficial partnership arrangements between corporate plantation investors and community- and smallholder-based tree growing, enhance the agency of local communities in defining such arrangements, and foster these partnerships. R5. Address land titling and restoration of Village Use Forests as part of the native species restoration commitment of plantation establishment in PFAs. R6. Develop and implement commitments to PPPP in the plantation forestry sector.
2. Smarter regulation and environmental management			
There are currently a high regulatory and transaction costs for establishing and harvesting forest plantations.	Effective and efficient regulation to encourage investment and ensure costs are fairly distributed along the supply chain	▪ Develop a clear rationale for costs and charges ▪ Adopt smart regulation principles using a mix of incentives, regulation and education. ▪ Provide resources to local government officials to support and facilitate development of plantations and related industries.	R7. Explore and adopt a ‘smart regulation’ approach, informed by such approaches elsewhere, to plantations and plantation wood value chains, involving a mix of government-, private- and self-regulation, industry initiatives, and community participation. R8. Work with Ministry of Policy and Legal Affairs to address regulatory impact of plantation and plantation value chain regulations.
There is currently limited interaction between levels of government and different government agencies responsible for plantations and processing.	A common understanding of the objectives and requirements to facilitate development of plantation and associated processing	▪ Improve communication and coordination between agencies and levels of government	R9. Improve communication and coordination between key agencies and levels of government, consistent with the 3 Opens Policy.

Theme and key issues	Goal	Policy options	Policy recommendations
There is currently no policy framework adequately covering plantation development, management, or the legality and sustainability credentials of plantation products.	Plantation specific codes and systems that are functional and reflect the level of risk associated with smallholder tree growers.	Design simple codes of practice, legality verification and certification systems; noting that independent certification could play a key role, but it is costly and gives limited market benefit to smallholders.	R10. Draw from relevant experience elsewhere, including in Viet Nam, to identify efficient, effective and mutually-reinforcing approaches to legality verification, plantation practices code, and certification, and implement these in a 'smart' way.
There is limited relevant extension for smallholders about plantation management and value chains.	Improved extension systems that reach smallholder farmers and communities.	Increase smallholders' knowledge of tree growing options and best-practice management, and of potential negative impacts of poor management and benefits of good environment practice.	R11. Explore approaches for effective extension drawn from other sectors and countries, and resource them adequately.
The environmental impacts of plantations are not well-monitored or – governed.	Improved systems of oversight of environmental impacts of plantations.	Develop regulatory systems that appropriate oversight of environmental impacts, drawing on a smart regulation approaches that recognise a mix of government-, private- and self-regulation. Adapt the ESIA process to better assess plantation development at a range of scales and proportionate to risk.	R12. Explore and adopt a 'smart regulation' approach, informed by such approaches elsewhere, to plantations and plantation wood value chains, involving a mix of government-, private- and self-regulation, industry initiatives, and community participation. R13. Work with Ministry of Policy and Legal Affairs to address regulatory impact of plantation and plantation value chain regulations.
3. Investment in forest plantations and processing			
Investment procedures are complex and inconsistent.	Clear and consistent approval processes for investors in tree plantations that are applied uniformly across companies and	▪ Recognise in investment decisions the economic and environmental benefits that can result from well located and designed forest plantations.	R14. Develop clear and consistent approval processes for investors in tree plantations that are applied uniformly across companies and provinces.

Theme and key issues	Goal	Policy options	Policy recommendations
	provinces.		
Tree plantation sector investment needs to be an effective partnership between government, industry, investors and the community (PPPP).	Both foreign and domestic investment in forest plantations occurring through recognised public private people partnerships that provide wider benefits and shared value.	▪ Promote the idea of partnership as the basis of delivering economic, environmental & social benefits	R15. Assess and prioritise tree plantation sector investment proposals on the basis of their PPPP credentials.
4. Plantation development in Production Forest Areas			
Production Forest Areas (PFAs) have been degraded through poor management, overexploitation, clearing for infrastructure and agriculture and encroachment by shifting cultivation. Integrating tree plantations can be a vehicle for forest landscape restoration.	Degraded forest lands in Production Forest Areas are restored through a combination of natural forest protection, restoration and plantation establishment by a range of actors.	▪ Identify PFAs that are suitable for plantation leases, based on extent of degraded land, market access and terrain. ▪ Develop clear rules to support private investment in plantations in PFAs (e.g. minimum areas of natural forest regeneration, length of leases, requirements for long-term restoration) ▪ Establish mechanisms to incentivise management and replanting – e.g. payment for environmental services ▪ Encourage community and smallholder tree growing with PFAs.	R16. Develop processes for planning and approving plantation establishment in degraded PFAs that ensure environmental and social benefits, that allow different scales and forms of investment, and that acknowledge local communities' interests and rights.

7.2 Objective 2. Understand the positive and negative social, economic and environmental impacts of different tree plantation development approaches

7.2.1 Plantation development case studies

Viet Nam

Two case study areas were investigated in Viet Nam, two villages in Hue Province and two in Quang Tri Province. In 2016, there were 70,830 ha and 91,431 ha of forest plantations in each province respectively. Forest plantation managed by smallholder growers accounts for about 35% of the area in both provinces. Most smallholders grow acacia on 4-5-year rotations, for sale as export woodchip or to local saw millers for furniture. In general, agriculture and forestry productivity has increased in the surveyed villages. There has been an increase in cassava and a decline in peanuts production due to drought in Ban Chua. Harsh weather conditions in Nam Dong has also caused a serious decline of rubber. In both Ban Chua and Nam Dong, acacia plantation areas have expanded.

Livelihood and Wellbeing

In general, forest plantations made significant economic, social and wellbeing contributions to the livelihoods of surveyed households (HHs). Approximately 90% of respondents consider that they are better off now than 5 years ago, with 82% nominating incomes from timber plantation as the main reason for livelihood improvement. Increased savings from selling timber was considered as a key strategy to ensure food security. More than 60% of HHs observed an increase in food security due to plantations. 12% of HHs experienced a decline in livelihood. These were HHs with newly established plantations, which require initial financial investments in seedlings and soil preparation and time in plantation management.

Timber sales and wage labour were identified as the top two income sources. On average, sale of plantation timber provided over VND 5 million (i.e. USD 217/year/household), accounting for 25% of the total annual household income. Almost 60% of HHs received cash income through wage labour from forest planting, tendering and harvesting, though this work is seasonal and irregular. More than 65% of the low income HHs are from Ban Chua village. The high-income group is exclusively comprised of Kinh HHs.

While productivity for acacia is generally increased, some respondents reported a decline in the quality and size of timber. This is due to pest infestation, increased seedlings density at planting and short rotations. Ethnic minorities in Ban Chua and Nam Dong reported a slight decline in price the past year and attributed this to traders manipulating price and the remote location of their plantations.

Approximately 90% of HHs believe that they are better off now than 5 years ago, and 82% of respondents consider this is due to timber plantation. They report positive impacts on their livelihood and economic, environmental and psychological wellbeing. Immediate/short-term benefits on physical and social capital include new or renovated houses, payment for children's education and ability to afford other daily necessities. Medium-term benefits include employment and financial security. Longer-term effects from plantations are a result of secure forestland ownership. This guarantees the family easy access to bank loans (both formal and informal) and future access to land for their children.

Interestingly, respondents discussed many positive psychological effects from plantations. Hope (i.e. better future, big weddings, better education for children, bigger houses and

inheritance for children) was frequently mentioned as an inspiration for investing in plantations. Many respondents expressed their satisfaction with enhanced self-esteem/confidence and social status.

> *"After five years, the plantations have changed my family's situation and status in the village" – A villager in Tan Quang*
>
> *"We are no longer the ones in debt…Not having to borrow from neighbours makes us feel lifted…!" – A villager in Ban Chua.*

Young people used to migrate to urban areas to find work and send remittances home. Having plantations allows them to stay around home and earn a decent living. This opportunity was viewed as a general wellbeing indicator by younger families. Older people feel that they are now able to fulfil their duties towards their children (i.e. education and land assets) and to their dead parents/ancestors (e.g. being able to have better offering for the dead). The effects of plantations extend beyond enhanced self-wellbeing and include opportunities to exert positive influence on others: for example, sharing knowledge and experience on forest plantations with community members; helping village fellows during crisis such as loss of plantations due to natural disasters; and contributing to social events in the commune. More than 70% of people interviewed felt that knowledge exchange (within and beyond their communities) was a key livelihood improvement strategy.

Land ownership and allocation

On average, HHs own between three and four hectares of forestland (Table 10). Lower income HHs own an average of 1.9 ha of forestland, a quarter of that owned by high-income groups or a little more than half of the medium income groups. In Ban Chua and Phu Thien, distribution land in uneven between households, with majority of households owning 2 hectares or less. There is a positive relationship between the size of household land holding and total annual average income. A high-income household with an average of 7.9 ha of forestland earns ten times more than a lower-income household.

Table 10: Income and Land Area in Surveyed HHs

Income group[3]	Annual Incomes (USD)	Forest area (ha)	Percentage of total surveyed HHs
Low	1,790	1.9	19%
Medium	4,050	3.2	37%
Medium-High	7,390	3.6	33%
High	18,900	7.9	11%

Increased income from plantations is due to increased area, higher productivity, quality of seedlings and price. In some areas, cassava and rubber has been converted for acacia plantations, despite the government's support on land clearing and irrigation for these designated crops. Kinh respondents noted higher buying price due to the increasing demand with more processing companies in the region. These people have direct connections with the factories or access to internet and other sources of information and are thus able to check/control daily selling prices.

[3] *For the purposes of analysis, households are groups in four income brackets: low income, medium, medium high and high income (this categorization is based on the decision No 59/2015/QĐ-TTg on income poverty for rural areas in 2016-2020).*

In Hoa Cat Village village, many of the rural migrants have between 3-4 hectares. Families that claimed to be affected by the changes in the Land Law reported the smallest land holdings (usually less than 0.5 hectares). In Nam Dong and Ban Chua, the ethnic minority group reported an average of 1.7 ha. Overall, the outliers (having between 12-27 ha/each) are Kinh migrants that came to the area with know-how, capital for hiring laborers and purchased land from other farmers. Under government policies, SFCs have allocated land to villagers. Many people in Ban Chua have recently received 0,4ha/household from SFCs while others cleared land near streams for plantations. Tan Quang villagers (mainly immigrants) have also secured plantation land by clearing and many had previously purchased land from Ban Chua. In Nam Dong, forestland is sold for 60-80 million VND/ha (USD 2,600-3,478/ha). Illegal logging in natural forests has opened new areas for further forest clearing for plantations. In 2013, Nam Dong has approximately 36 ha of natural forests. By 2015, the district lost 80% of its natural forests. Respondents in Nam Dong district reported a serious decline in NTFPs for subsistence and due to the rapid loss of natural forests. This indicates the importance of maintaining broad governance and control of impacts on natural forests to fully capture the benefits from expanding plantations.

Twenty six percent of HHs interviewed were dissatisfied with forest land allocation processes and 30% do not have forestland titling papers. The main reasons cited for dissatisfaction include inconsistent and complex procedures for acquiring Red Books; and the lack of transparency and grievance mechanisms. In addition, more than 43% of the interviewed HHs are not involved in FLA processes; only 51% were engaged in land inventory and demarcation in the field; and less than 37% were informed/involved in the development of commune land-use and land allocation meetings. Interviewed ethnic minority HHs showed a low level of awareness on the amount and location of land allocated. They tend to rely on the figure/papers given by the local authorities.

Finance and human resources, allocated to planning, implementing and monitoring land allocation are not adequate, especially at local level. Despite Circular 38 stipulating involvement of local communities in decision-making processes on forest allocation, it was found that there is still a lack of participation of smallholders in FLA processes. These issues has been discussed extensively in Viet Nam. Main challenges include the slow allocation process; lack of participation and attention to customary tenure; limited financial benefits; incomplete benefit sharing mechanisms (Phuc, T.X et al. 2013).

Growing land demand for plantations development and increasing population growth is placing increasing pressures on land. Lack of transparency and grievance mechanisms around FLA contribute to eroding trust in local authorities and cause conflicts between smallholders, state forest enterprises and authorities.

Most surveyed HHs regard traders as important and necessary. More than 80% of timber was sold to traders and the rest direct to factories, the latter mostly being from HHs with large land area and harvesting facilities. Despite the availability of good quality seedlings from state own companies or research centres, villagers tend to buy from local nurseries due to their proximity, close relationships and lower price. There have been rapid changes to the quality and operations of these private nurseries. However, quality of the seedlings is not monitored or certified.

Other measures to support plantations

Apart from land allocation, other measures to support plantation development include finance and training. Access to bank loans is important for smallholder investment. Over 75% of lower income HHs would like to make bank loans but many feel hesitant due to the complex loan processes and the fear of not being able to make repayments. To establish one ha of acacia, farmers need to invest 15-20 million VND (i.e. USD 650-860, excluding their own labor). The GOV often gives in-kind support, equivalent of VND 3 million (i.e. USD 129$) per HH, mainly in the form of seedlings. Due to the limited budget allocated from the central GOV, between 10-30% of HHs have received this support.

Often provincial or district governments are faced with difficult decisions in selecting the "right" HHs for support and the trade-offs between the program effectiveness and equity. Local authorities tend to ensure that the money is widely distributed and more HHs can benefit. However, selected HHs are sometimes not interested in this kind of support, due to the complex application procedures. Cutting regulatory burden for poor HHs can facilitate their engagement with plantations and investment decision processes.

To promote longer-rotation plantations, Hue province plans to invest AUD 13.5 million in the period of 2017-2020 to develop 13,000 ha of forest managed for larger logs. Some high-income HHs have diversified production to include longer-term plantations, but most interviewed HHs were lukewarm towards long rotations. They were aware of the potential higher returns, but their decisions were influenced by their available resources, access to support and perception of risks. Mechanisms to support lower income HHs over the longer growing period, managing risks from natural disasters (e.g. low interest loans or insurance schemes); and new incentives to stimulate investments from high-income HHs should be developed.

Five to ten training courses are held in each village every year on agricultural and forestry topics. Most respondents had received some type of training for plantations. However, this training was regarded as repetitive with a strong focus on silviculture. In addition, these training courses have been attended by the same people, thus the content has not reached wider communities. Smallholders raised their concerns with the lack of more timely support to deal with urgent issues such as pest management and seedlings quality.

> "There are training courses given by extensionists, but they often tell us what we already know...We have planted trees for many years now. What we need urgently, is timely technical advice on pest management. More than 200 ha of our forest is dead…and the nature of infestation changes every year." – A villager in Huong Tra.

Plantations Effects on Environment

Surveyed villagers indicated that plantations had positive environmental effects were observed on landscape, local climate, and soil quality (Figure 5). Respondents valued the aesthetic aspect of a "green landscape" (compared to the barren land during the early 80s after the war); the new habitat for birds and reptiles; and the cooler local climate with more shades from acacia trees. Villagers noted some positive changes in soil quality, less compaction and erosion, more organic matters thus fertility.

Negative effects were recorded mainly on water quantity/quality, and biodiversity. Due to the encroachment near streams and the use of pesticide, erosion (along the bank) and run-offs became more serious. In some areas, supply of groundwater is decreasing. Dry creeks and lakes were more frequently observed; villagers need to dig a lot deeper (15-20 meters) for fresh water wells. A decline in biodiversity is also cited as a negative impact, especially in Nam Dong district, where there is a high rate of natural forest loss. Big mammals and pheasants are no longer spotted in the areas.

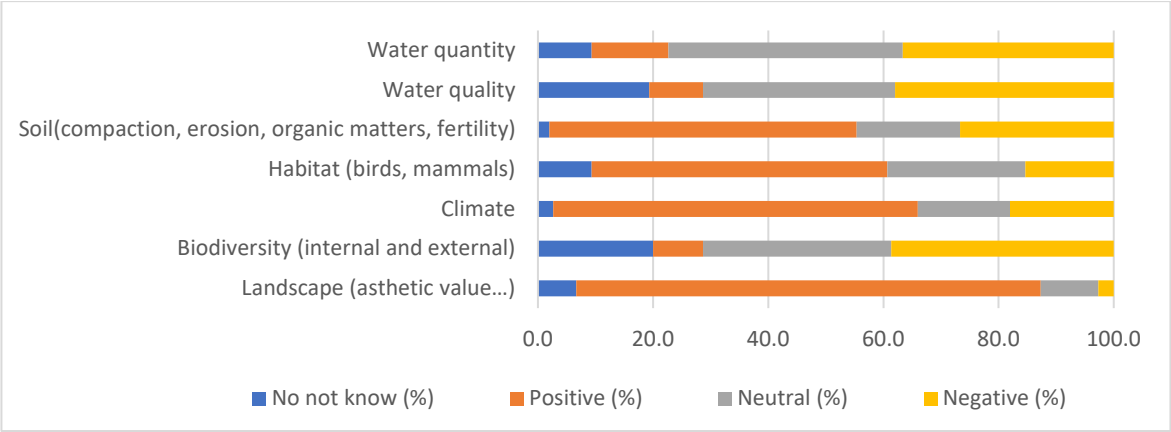


Figure 5: Perceptions of effects of plantations on environment values in Central Viet Nam

Lao PDR

Comparison of integrated agroforestry and traditional plantation models

This section compares the experiences of an ethnic minority village participating in a eucalyptus alley-cropping agroforestry model (involving SEL) with an ethnic Lao village's experiences with a traditional concession-style, eucalyptus plantation model (involving BLPP).

Table 11: Comparative Village Livelihood Summary

Village/Indicator	*Ta Oy Village (n= 23)* *(SEL Eucalyptus Agroforestry Model)*	*Atsapangthong Village (n= 24)* *(BLPP Eucalyptus Concession Model)*
Village Area	1,712 ha.	2,317 ha.
Plantation Area	66 ha.	583 ha.
Avg. HH Members	6.7 persons	7.0 persons
Rice Production	Upland swidden, rainfed paddy, irrigated paddy	Rainfed paddy
HH Rice Security	7.7 months	11.1 months
Avg. HH Annual Income	$1,428	$3,061
Avg. HH Annual Expenditures	$1,262	$1,929
Avg. HH Debt	$205 (Nanyoby Bank)	$77
Outmigration	2 male students	37 persons (18 males, 13 females)
Avg. HH Remittances	Nil.	$795

**Note: reported HH income, expenditure, savings, and debts did not always balance. Financial figures in USD equivalent.*

Reported community income data revealed notable patterns between the two communities. In Ta Oy village, Salavane province, the main income sources were reported as: (i) illegal natural forest timber sales, (ii) livestock sales, (iii) SEL land lease income (Table 11). Overall income from the SEL project (including village land lease fees, plantation labour and a company livestock programme) represented 26% of total household income for 2016 (see Figure 6).

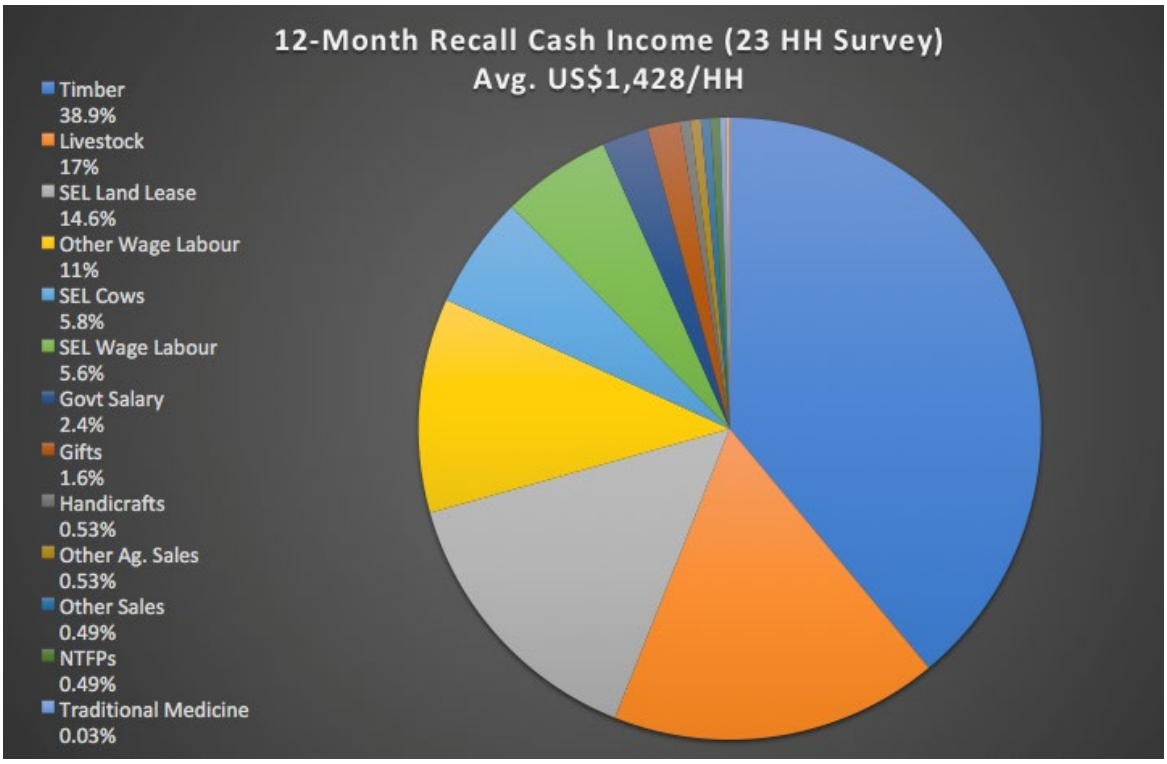


Figure 6: 12-Month Income in Ta Oy Village (Stora Enso Lao PDR project), 2016

In the ethnic Lao, Atsapangthong village, Savannakhet province, where Birla Lao Ltd developed plantations, average incomes were double in comparison to upland Ta Oy (Table 12). The main income sources amongst surveyed households were: (i) financial remittances (particularly from village youth working in Thailand or Vientiane), (ii) livestock sales, and (iii/iv) income from the rice economy. Plantation labour with BLPP ("Birla Wages") represented just 2% of average household income, although this did play a more significant role for some poorer surveyed households (see Figure 7).

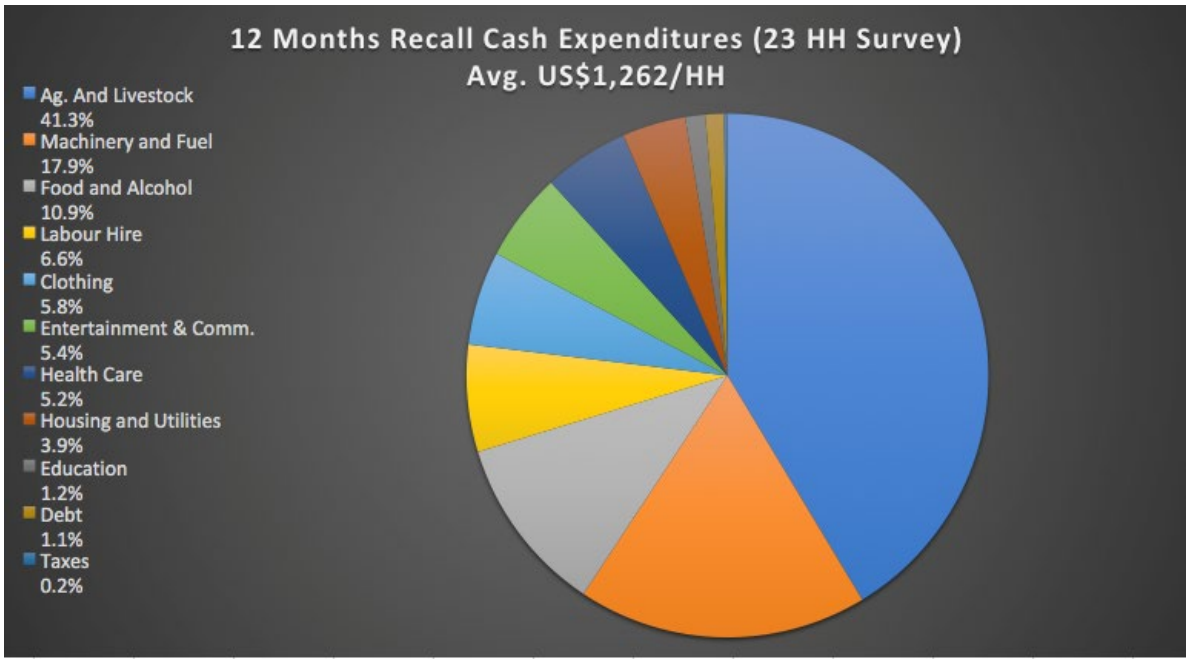


Figure 7: 12-Month Income in Atsapangthong Village (Birla Lao PDR Pulp & Plantations project), 2016

Table 12: Comparative Village Summary of Livelihood Outcomes

Village/Indicator	Ta Oy Village (SEL)	Atsapangthong Village (BLPP)
HH Participation in Plantation Zoning	19/20 report HH consultations (3 no response)	9/24 report HH consultations
Previous Land Tenure	Communal swidden fallow forest-land	Informal household reserved land (*din jap jong*)
Previous Land Cover	Young to intermediate swidden fallow	Natural dry dipterocarp forest, with large trees
Impacts of Land Acquisition	Loss of swidden land, with compensation	8/24 report losing *din jap jong*, 7 without compensation
Access to Forest and Non-Timber Products (NTFPs)	16/23 report loss of access to NTFPs	17/24 report losses of access to timber and NTFPs
Impacts on Food Security	16/23 positive impacts, 7/23 mixed	20/24 report negative impacts
Contribution to Livelihoods	19/23 report positive impacts	3/24 report positive impacts, 7/24 report being worse off
Overall Well-Being from 5 Years Previous	23/23 HH report improved livelihoods	13/24 report improvements (largely due to remittances)
Overall Views on the Project & Potential Expansion[4]	4/23 very positive; 7/23 somewhat positive; 10 negative; 1 mixed	9/24 approve, 15/24 disapprove

There was significant variation in community perceptions of the two models (Table 12). In Ta Oy (SEL), more villagers reported being consulted on the project, involved in participatory land use planning, receiving compensation for land, and that plantations had positive impacts on both food security and livelihoods. Yet, this did not always translate into full support for plantations. Experience may shape local preferences between providing for immediate needs and potential future rewards. This may be related to adopting, in the villagers' minds, a risk averse 'subsistence livelihood ethic', or it may be a more practical assessment of the increasing value of land and future opportunity costs.

In the Atsapangthong (BLPP) case (an ethnic Lao community), there was little evidence of PLUP, natural forest was cleared for plantations, and many villagers lost access to informal jap jong forest-land due to an inability to pay land taxes. A significant number of HHs reported being made worse off by the project, and a majority of disapproved of the company's approach.

Other Plantation Models

Analysis of plantation livelihood contributions undertaken in Alex van der Meer Simo's PhD project included:

[4] *In Ta Oy village, respondents were asked about their perceptions on the SEL project and about ther interest in allocating more land to the agroforestry scheme (since this is a potential future option). In Atsapangthong village, respondents were only asked about their perceptions of the overall project, since there is no scope or proposal for further project expansion in this village.*

- Stora Enso Lao PDR Ltd (SEL) agroforestry model and smallholder-led arrangements in Ban Nong and Ban Xepon villages, near Sepon in Savannakhet Province;
- contracted out growers with Oji Lao Plantation Forest Ltd (Oji-LFPL, now Mekong Timber Plantations) in Ban Pakkading in Bolixamxay Province; and
- village leases by the Burapha Agroforestry Company in Ban Hinheub in Vientiane Province.

Villagers received different kind of benefits in these different projects. SEL hire labour to work in plantations. Participation is decided by the village head. The company contracted local households to clear areas of forest-land within their concession, with each household then responsible for managing (including planting and maintaining trees). In this community, all sampled contracted households attributed livelihood improvements to the tree plantation project. All three projects contribute to Village Develop Funds and make annual lease payments to district and provincial governments.

Results indicated that 70% of the sampled population attributed some livelihood benefits to the development of commercial tree plantations. Annual incomes from plantations account for 64% of the total HH income in Ban Hinheub, 38% in Ban Xepon, but only 9% in Ban Nong and Ban Pakkading. In absolute terms, commercial tree plantations were the largest source of annual income in Ban Hinheub and Ban Xepon, where household annual incomes (including the value of subsistence activities) averaged $3,820 and $2,362, respectively. Contract tree growers in Ban Pakkading received only $623. In Ban Nong only $203 annually. These smaller amounts reflect the cyclical nature of income in a plantation project, when there is only a relatively small area planted around a village and labour opportunities are limited once trees are established.

Respondents in Ban Pakkading in Bolixamxay Province reported that in compensation for the concession of 170 hectares of land, Oji LPFL paid US $8,640 to the VDF, which was used to pay for electricity. Similarly, in Ban Nong, in Savannakhet Province SEL is managing a VDF of US $30,800, that paid for the construction of water infrastructure that supplies approximately 90% of households in the village.

In Ban Pakkading, many informants were concerned with the poor performance of the contract outgrower arrangements with Oji-LPFL. 63% of villagers who planted have failed to sell their trees. Oji-LPFL advised farmers to sell their trees to a nearby plywood mill through an intermediary middleman. This middleman has not paid and owes over $9,500 to these smallholders. Timber market conditions are changing rapidly in Lao PDR.

7.2.2 Economic analysis of forest production systems

Viet Nam

We compared financial returns from a trial in Acacia plantations that used cost and income data from a state forest company in Quang Tri province (Maraseni et al. 2017b). The study looked at the effect of rotation lengths (5, 6 and 10 years). Mean annual timber growth was 17.7 m^3/ha/yr in short rotation and 20.2 m^3/ha/yr in in the long rotation stands. 5-year and 6-year rotation plantations were not thinned. 10-year rotation stands were thinned at 6 years. Planting density varied from 2500 seedlings/ha in 5-year rotation stands to 2000 seedlings/ha in 6-year rotation and 1650 seedlings/ha in longer rotation plantations. The financial returns in the study may not be directly applicable to all smallholders as they may be using different production systems to those of a state enterprise (on a scale of <3 ha compared to 1000s of ha), no hired labour and no machinery and thus have different costs and revenues. However, the comparisons give an idea of potential returns.

Results indicate that, under current market conditions, Acacia plantations in Viet Nam provide excellent returns compared to other agriculture crops. Net Present Value (NPV) indicates the current value of discounted future costs and income.

Returns are higher in longer rotation plantations. Using a 7% discount rate, the NPV of 10-year rotation plantations was US$4865 compared with US$1803 under a 6-year rotation or US$1147 in a 5-year rotation plantation (Table 13). The higher return is because more than 50% of timber from longer rotation plantations is sawlogs that attract a higher price (US$67/$m^3$) than do woodchips (US$45/t or US$27/$m^3$). Planting and fertilisation costs for the 10-year rotation are also lower than for shorter rotations due to the lower planting density. The application of a higher discount rate does not change the order of benefit gain (for longer rotations). Thinning at year 6 in the longer rotation plantations does not increase net benefit. It can produce some short-term income from woodchips but this take time, labour and management costs and may result in damage to the remaining trees.

Table 13: Financial returns from three different density and rotation age of acacia plantations

Financial indicators	5 year rotation		6 year rotation		10 year rotation	
	7% DR	12% DR	7% DR	12% DR	7% DR	12% DR
Net Present Value, NPV (US$/ha)	1,148	762	1802	1,222	4,865	2,972
Benefit Cost Ratio (BCR)	1.51	1.37	1.80	1.61	2.82	2.39
Internal Rate of Return (IRR)	27%	27%	31%	31%	33%	33%
Annual Equivalent Value (AEV) (US$/ha)	280	211	378	297	693	526

Note: AEV is annual equivalent value, discounted NPV of investment. DR is discount rate (Maraseni *et al*., 2017b)

Even considering that two short rotations of 5 years can be grown for each 10-year rotation, the returns to the grower are 4.2 times higher for the longer rotation. Tree growers need to wait longer for the income and the preference for more immediate income. This suggests that most smallholders use a high effective discount rate in deciding their plantation strategy. Most of the tree growers in the region are smallholders, and many are poor and/or old, with younger people migrating to urban areas for better education and earnings. Trees are a significant contributor to the landholders' livelihoods, they have small land area, need quick returns and therefore favour short rotation plantations. There is anecdotal evidence that, with strong demand for woodchips, many growers are harvesting their trees on even shorter rotations (3-4 years). This is resulting in lower wood quality and consequent reduced prices.

In interviews with 100 households in four villages in Thua-Thien Hue Province, some high-income HHs have diversified production to include longer-term plantations, but many were at best only moderately interested in long rotations. They were aware of the potential higher returns, but their decisions were influenced by their available resources, access to support and perception of risks. Recent events can also influence preferences. For example, Typhoon No. 10 (Sept. 2017) caused significant damage to property, especially plantation and infrastructure. More than 3,500 hectares of plantations were affected, with damage to more than 50% of trees in the plantations. In addition, Acacias grown for longer than 10 years or to more than 30 cm DBH (diameter at breast height) are likely to be attacked by insects and borers that degrade wood quality. Bigger sawlogs require specialised heavy machinery for harvesting, loading and transporting logs from the forests, as well as in the receiving sawmills. Bottlenecks at various stages of the forestry value chain (contracting terms, chain linkages, and transparency in distribution of cost and benefit among different members of the chain) discourage investment. Other constraints are limited availability of quality seedlings and lack of long-term credit facilities.

Lao PDR

The project undertook financial analyses in two settings in Lao PDR. three models of Eucalyptus plantation: Eucalyptus monoculture and two agroforestry models (Eucalyptus intercropped with rice and Eucalyptus intercropped with cassava) using data from Burapha Agroforestry Co Ltd and the projects described above for Alex van der Meer Simo's PhD study.

Based on the assumptions about costs and returns and assuming all the product yields are sold in market and accrue to the investor, all the agroforestry models result in positive NPVs using a discount rate of 12%. IRRs range from 16.7% for eucalypt-cassava to 20.1% for the eucalypt-rice intercropping model. The latter model also produced the highest LEV (Figure 8). LEV for Eucalyptus-rice intercropping is approximately US$1459 ha-1, with an AEV of US$175 ha-1.

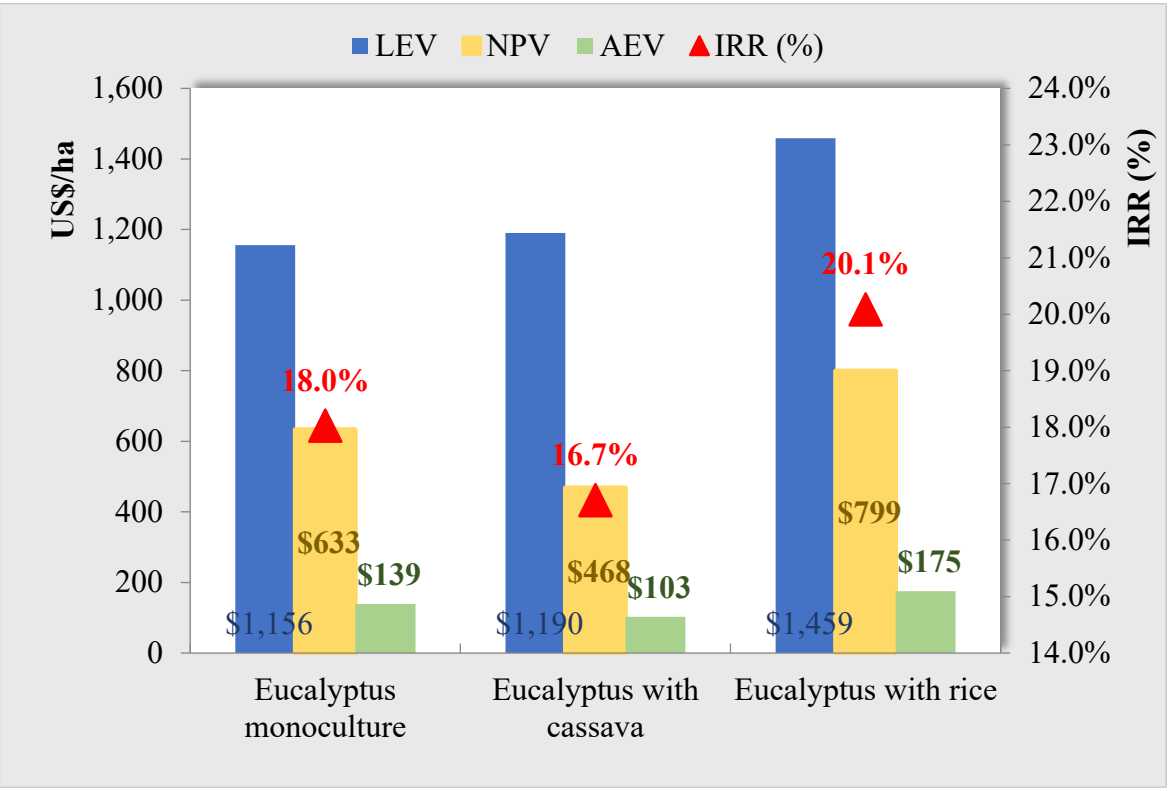


Figure 8: LEV, NPV and IRRs for three models of Eucalyptus plantations

Sensitivity analysis of LEV to discount rates showed that returns are much higher with a lower discount rate. Using a discount rate of 12%, the financial LEV of a Eucalyptus monoculture is approximately US$1156/ha compared to US$2820/ha with a discount rate is 9%. While using a discount rate of 15 %, lowered the LEV from eucalyptus with cassava to US$269/ha compared with US$1938 ha-1 with a discount rate of 9%.

Increasing plantation yield increases the LEV significantly for all three plantation models. For instance, increasing the growth rate for Eucalyptus monoculture by 10% increases the projected LEV from US$1156 ha-1 to US$1949 ha-1. By contrast, decreasing the growth rate by 10% reduces LEV from US$1156 to US$363 ha-1.

For these reasons, it can be concluded that all types of Eucalyptus plantations are relatively sensitive to all level of growth rate.

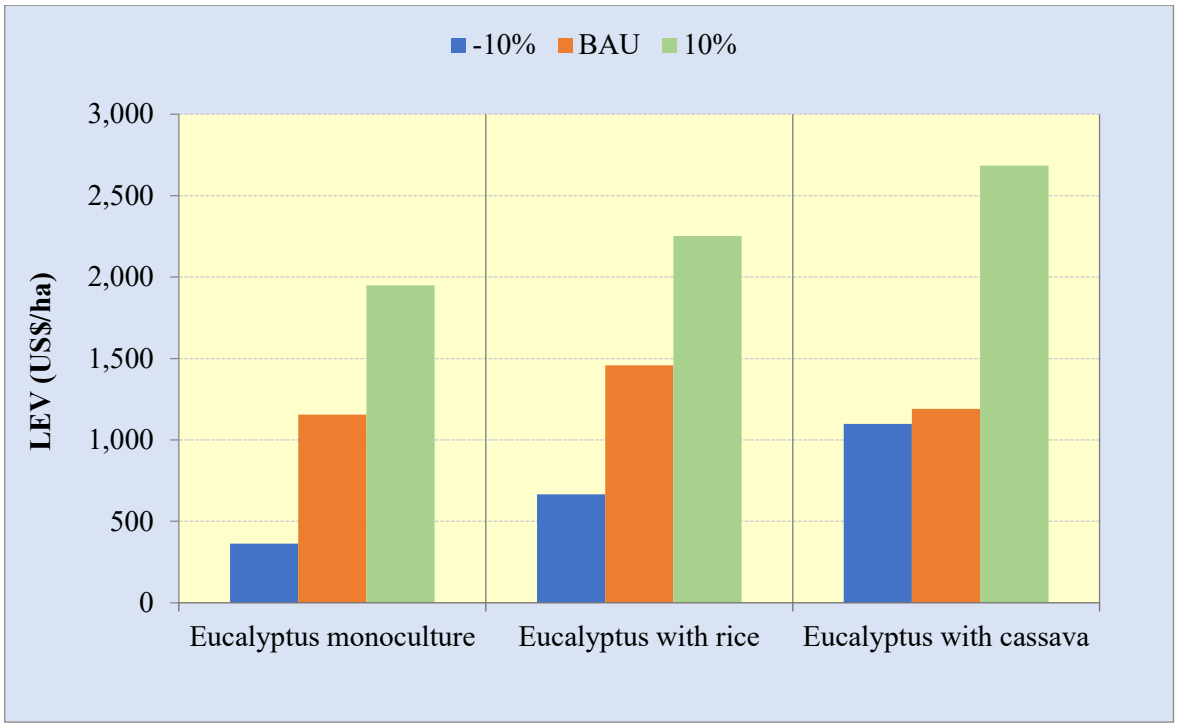


Figure 9: Sensitivity of LEV of three plantation models to changes in yield

Increasing stumpage price of Eucalyptus increases by 10% ve BAU, the financial LEV of Eucalyptus monoculture are about US$1949/ha compared to a lower LEV (US$363 ha-1) when the price decreases by 10% below BAU.

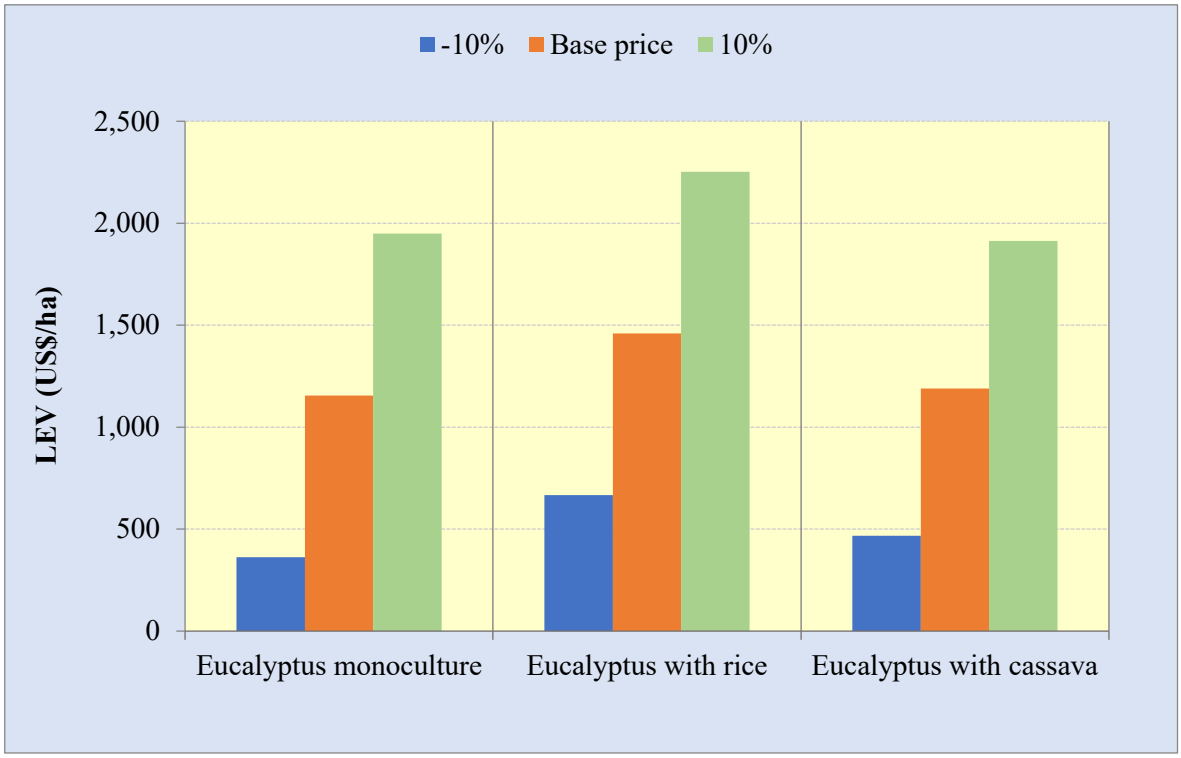


Figure 10: Sensitivity of LEV of three plantation models to changes in stumpage prices

Comparing NPV of different plantation models in Van der Meer Simo's field sites to those that the project proponents projected before the establishment of the plantations, and to

local alternative land uses, indicated that independent smallholder tree-growers had the highest NPV (Table 14). For industry-led commercial tree plantations, the eucalyptus agroforestry plantation in Ban Hinheub had the highest NPV for smallholders. In Ban Nong the NPV from plantations ($1,014/ha) was similar to the NPV from swidden agriculture ($1,001/ha), assuming a cash value for the swidden production. This helps to explain why smallholders in Ban Nong were less interested in the potential expansion of plantations. Finally, in Ban Xepon, the NPV from smallholder families leasing land to Viet Namese companies for banana plantations was found to be higher than the NPVs from tree plantations in the other villages. Respondents in Ban Xepon noted that indeed they may even consider converting their own yang bong agroforestry plots to banana leases, if the lease prices that Viet Namese companies offer continued to increase.

Respondents reported displacement from household farm plots or loss of access to common resources as negative impacts on their livelihoods.

Table 14: NPV from different types of land-use at four locations in Lao PDR

Village and Plantation Model	*NPV/ha 7 year cycle (5% discount rate) 1 USD = 8112 LAK*
Ban Hinheub (Burapha) – Land sharing with farmer labour	
Projections[5]	$1,566
Documented smallholder returns	$1,233
Ban Nong (SEL) – Land sharing with company-managed labour	
Projections[6]	$1,927
Documented smallholder returns	$1,014
Swidden agriculture	$1,001
Ban Pakkading (OJI LPFL) – eucalyptus contract farming	
Projections[7]	$1,830
Documented smallholder returns	$317
Ban Xepon – Smallholder-led agroforestry plantation	
Documented smallholder returns	$3,551
Land leased to Viet Namese companies for banana plantations	$1,882

[5] Plantation offers labor opportunities equal to US$ 1011/ha (162 labor days per hectare over 7 years cycle and daily wages at US$ 6.2). BUFARCO grants a VDF at US$ 350/ha, which in this case respondents reported to not have received. We did not have data from BUFARCO on potential inter-alley rice harvest. Based on Alex van der Meer Simo's estimations, the average value of the harvested rice in year 1 of the 7-year cycle was US$ 340/ha.

[6] Plantation offers labor opportunities equal to US$ 690/ha (112 days needed per hectare over 7 years cycle and daily at US$ 6.2). The company grants a VDF at US$ 350/ha. Based on SEL's estimations in a 'model' village, smallholders can harvest rice valued at U$ 967/ha in year 1 of the 7-year plantation cycle. Based on Alex van der Meer Simo's estimations, smallholders harvested rice valued at US$ 124/ha in year 2 of the 7-year plantation cycle.

[7] Oji LPFL estimated potential harvest at 189 tonnes of wood per hectare. Oji LPFL had agreed to purchase wood at US$ 14.8 per ton 7 years after planting. Oji LPFL provided a loan for inputs to smallholders valued at US$ 226/ha, which smallholders have to repay when selling wood.

7.2.3 Economy-wide effects of plantations

Analysis of economy-wide effects was constrained due to lack of data. The following results present examples of analysis of these effects at a national level for the forest sector in Viet Nam and at the regional level for a pulp mill development in Savanhakhet Province in Lao PDR

Supply and Demand for the Forest Sector in Viet Nam

The study used data from an input-output table of the Viet Nam economy most recently developed in 2012 and updated and restructured it into a table for 2016. The sources of updated data were obtained by updating output vectors from Viet Nam enterprise survey carried out in 2016 and calculating intermediate input vector from enterprise survey and Viet Nam Household Living Standard Survey carried out in 2016. Forest extraction subsector data were included as a separate sector in the IO calculation.

Results indicated that on the demand side, 90% of the forest product is used for intermediate consumption (for production) and 10% for final use. The value of imports for the forest sector accounted for 43.8% of the value. Imports are relatively high in value, this indicates that high value wood is essential for domestic demand, while low value timber from domestic sources is exported. This indicates an opportunity to change domestic plantation management to increase the value of domestic timber to meet domestic and export demands. For wood extraction, the final demand only accounts for only 15% of intermediate demand (wood processing industries e.g., indoor/outdoor furniture, paper and furniture etc.) On the supply side, wood extraction value accounts for only 28.4% reflecting the fact that the relative price of products from domestic wood are very low while the value of wood imports is high. Adding value to domestic wood will occur in processing and trade.

The power of dispersion and sensitivity indexes of wood extraction to increased domestic production are lower than the overall average for the forestry sector. The products of this sector mostly result from the input from the sector itself or input from other forest sector sub-sectors. This suggests that the linkages between the forestry sector and other economic sectors are generally weak.

While multiplier and inter-sectoral effects of forestry in the overall economy are quite low, spill over effects from the forestry sector in general, and the wood extraction subsector in particular, are very impressive. The irony is that the sub-groups in the forestry sector interact strongly (sector 1: Forest planting and tending products; sector 3: Other forest products; harvested from the forest; and sector 4: Forestry service). The input-output table data show that the economic sector 12 (manufacture of wood, paper & related products; printing) and sector 16 (manufacture of furniture & other goods; repair & installation) had high impact on sector 2 (wood extraction) with the power of dispersions on spill over effect of 7.146 and 2.238 and power of dispersion on induced effect of 12.687 and 3.039 for the manufacture of wood, paper & related products; printing (sector 12) and manufacture of furniture & other goods; and repair & installation (sector 16) respectively.

Output of the forestry sector by the factor of final demand was highest for the export sector, while the impact induced by exports to outputs of whole economy was low. The input-output table shows that the export of the forest sector is basically the export of timber or wood (as accounted in the GDP).

Sector 12 (manufacture of wood, paper & related products; printing) has a higher penetration coefficient for imports compared to the average for sector imports. This suggests that Viet Nam's demand for intermediate manufactured wood products is very high. Therefore, meeting this domestic demand, that still depends significantly on raw materials from abroad for processing into high value-added wood products for export, also represents an opportunity to improve value for local forest growers. The products of the

forestry sector are mostly inputs of the sector itself and that of forest sub-sectors (in IO table). This partly shows that neither the forestry sector, in general, does spread very strongly effect to other economic sectors nor other economic sectors do on the forestry sector. Among other sectors in the economy, the economic sector 12 (manufacture of wood, paper & related products; printing) and sector 16 (manufacture of furniture & other goods; repair & installation) had high impact on sector 2 (wood extraction) with the power of dispersions on spill over effect of 7.146 and 2.238 and power of dispersion on induced effect of 12.687 and 3.039 for the manufacture of wood, paper & related products; printing (sector 12) and manufacture of furniture & other goods; repair & installation (sector 16) respectively. The export of the forest sector is basically exporting timber or wood (as accounted in the GDP). It also shows that in order to increase the value of timber exports, attention should be paid to the structure of the plantation forest by converting more area to higher-value, long rotation plantation forests.

Assessing the regional economic impact of a pulp mill development in Lao PDR

The objectives of this activity were to: (1) To assess the impact of a 300,000 tonne/yr bleached kraft pulp mill in Savannakhet Province at regional level (2) To assess this impact at national level; and (3) provide recommendations to central government for design, policy framework and implementation for forest plantation programme.

Sun Paper Holdings (Lao) has recently established a 300,000 tonne/year bleached hardwood Kraft (BHK) pulp in Sepon District, Savannakhet Province, Lao PDR. With the production capacity of 800 to 1000 tonne/day BHK pulp from 3000 green tonne, this mill needs about 100,000 ha of plantations of trees to supply approximately 1.2 million green tonne of plantation wood (Eucalyptus and Acacia) per year. At present, approximately 200,000 green tonne per year is available Lao PDR and the remaining resources of 1,000,000 green tonne are currently imported from Thailand (Eucalyptus) and Viet Nam (Acacia).

The pulp mill uses modern technology from Europe. It provides a potentially significant contribution to both regional and national economy. It will change the plantation wood market environment in Lao PDR. The direct contribution to the regional economy can be described as follows.

First, a typical project exporting a 300,000 tonne/yr bleached hardwood Kraft (BHK) pulp already involved an initial investment of about USD432 million for equipment, wharf facilities, roading, buildings for workers and office, modern nursery and other infrastructure while Provincial Department of Finance already received tax revenue from initial construction of about $5.2 million and employment for some thousands of men.

Second, the new pulp mill is paying between 300,000 to 350,000 Kip (US$35 to 45) per gmt at the mill gate. The company is offering a mill gate price of woodchip from Viet Nam and Thailand of USD120 per tonne. With the current production of 3000 green tonne of plantation wood per day, it will potentially generate the regional income of 900 million kip per day or 328.5 billion Kip per year from wood purchases. A proportion of this amount of income will go to Lao plantation growers if plantations are developed in Lao PDR. The proportion depends on harvest and transport costs, traders' fees and government charges on harvesting and transport.

Third, assuming an export price of BHK pulp in China of USD1100, Sun Paper will generate 2,722 billion Kip from export earnings.

The aim of this paper is to examine the full impact of a pulp mill on the regional and national economy and its development. To achieve this aim we modelled the effects of the pulp mill project on 6 aggregated sectors in the provincial economy and in the national economy. Using data from an input-output analysis of the Savannakhet economy by Asian Development Bank, we calculated the total income multipliers and type multipliers for the highly aggregated Savannakhet Regional Economy (1) Forestry, (2) Agriculture, Mining, Food and Textiles, (3) Wood & paper products, (4) Manufactured goods, (5) Electricity,

Construction and transportation, and (6) Services. Additionally, the impact of a pulp mill project on gross output and on regional income.

From the analysis, we found that each unit of output in the forestry and logging sector generates 0.36 units of household income to its employees, 0.60 units in total household income to the province and hence a flow-on of 0.24 units. The wood industry sector generates an additional 0.34 units in total household income to the region. The analysis also shows an income multiplier of 1.20 for the Forestry sector, implying that each $100 of additional sales by Forestry creates an additional regional income of $120. While the income multiplier for Wood & paper products is approximately 1.68, those for Manufactured goods, Electricity, Construction and Transport, and Service sectors are 1.21, 1.22, and 1.11 respectively.

At the Provincial level, the establishment of the pulp project is projected to have a substantial impact on the gross production of Savannakhet economy. The gross outputs for all sectors increased by 24%, largely due to the impact of the expansion of the Forestry sector. Linkages and impacts on other sectors are relatively small - much of it in the transport sector for transporting wood from Viet Nam. The new export demand from the forestry sector grows almost thirtyfold, becoming the second highest sector in the provincial gross output. The agriculture sector increased slightly in total value. There were some changes in the value of other modelled sectors. A pulp mill project, being an export earner, will therefore aid both regional and national trade of balance significantly.

We also calculated the impact of the pulp mill at the national level by converting the most recent Supply-and-Use Tables to Input – Output Table 2012-2013. The analysis shows that impacts of the pulp mill are relatively small but positive at national level because most other provinces are relatively unaffected by the new mill. The mill is capital intensive because machinery and labour were largely supplied from China or overseas suppliers.

Currently for the Province, imports of wood from Viet Nam and Thailand account for 90% of the total wood input but are generally low with the total content of imports amounts to $6 for each $100 of sales by forestry sector. These figures are different from most other sectors in the economy that have greater economic contribution from imports.

The projected impacts of the pulp mill at both provincial and national scale, might be much larger if more of the raw material wood fibre is grown in Lao PDR by local farmers or companies. The pulp mill project manager has indicated that it has already secured a eucalypt plantation area of 25,400 ha, which consists of 3500 ha of concession land; areas under lease from villagers in an outgrower scheme 1+4 (6450 ha), and the purchase of Birla Lao plantations of 15,407 ha. These figures have not been independently verified. The company is planning to expand this plantation area to 70,000 ha. The region around the mill was heavily impacted by bombing during the American war. Outgrower schemes need to include clearance of UXOs before commencing plantation activities.

Other problems with the mill are environmental issues recently raised by the local television and local population in Sepon District regarding the potential for pollution of local rivers and impacts on water used by the local people, and bad odours for the local population. Native timber have been used in energy production of the mill.

7.2.4 Natural capital and environmental benefits and impacts

Viet Nam’s plantation program has been considered a major success, increasing forest cover by about 2.37% annually from 1990 to 2010. However, there has been little analysis of the ecosystem services provided by these plantation ecosystems. This type of ES assessment can be used to quantify the wider benefits of planted forests and raise awareness of policymakers, forest owners and managers, environmental organisations and local communities. This type of analysis can also be used to for assessing the wider economic values of planted forests and provide a basis for new funding opportunities from marketing the ecosystem services produced from planted forest and other landscape

restoration programs. Assessments can also provide guidance on preferences for different ecosystem services to local people and therefore maximise the contribution of planted forests to local communities, the broader society and the global environment.

The research focused on two provinces in the north-central coastal area of Viet Nam, Thua Thien-Hue and Quang Tri. A quantitative assessment was undertaken using land cover data. Carbon values for different land cover types were obtained from the literature (ref Table 17). Water yield and biodiversity components were valued using a qualitative approach from published research, with results for biodiversity and water quantity on different landscapes from various sources, translated into scalar variables.

In Viet Nam, there has been a large-scale change in land cover from 2005 to 2015 across two provinces in central Viet Nam (Hua-Thien Hue and Quang Tri). Planted forests increased by 39% from 131,000 ha to 183,000 ha, mostly converted from non-forest land. Sixty percent of this increase in planted forest was in Quang Tri province, 40% in Hua-Thien Hue. Non-forest is now 45% of the total area of 966,000 ha, decreasing from 52%. Rich forest declined by 20% to 4% of the total area and medium and poor forest areas increased by 6% and 10% respectively.

Forest carbon stocks across the two provinces increased by 3 percent from 23.4 million tonnes to 24.1 million tonnes, with an increase of 1.2 million tonnes in planted forests. There was an overall loss of carbon stock in natural forests of 0.56 million tonnes due to the conversion of rich forest to medium or poor forests. Conversion of non-forest to forest results in reduced soil and sediment loss and improved biodiversity habitat and potentially improved flood protection. Forests use more water than non-forest land because of higher evapotranspiration rates. Increased forest cover reduces water yield.

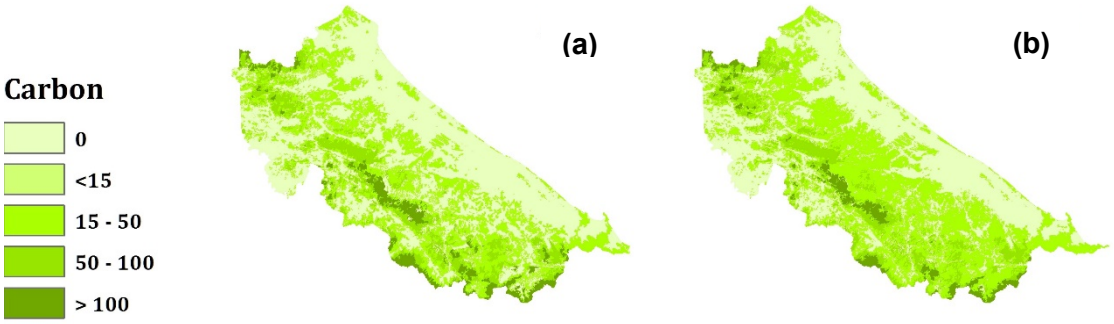


Figure 11. Carbon stock estimation in different land-cover in 2005 (a) and 2015 (b)

Table 17. Carbon stock change over 2005-2015 by LU/LC

LULC	Carbon density (tC/ha) 2005	Carbon density (tC/ha) 2015
Evergreen broadleaf – Rich	171.2	148.5
Evergreen broadleaf - Medium	73.4	71.2
Evergreen broadleaf - Poor	31.7	29.2
Forest plantation	21.0	23.6
Non-forest land	N/A	N/A

Ecosystem benefits from planted forests are closely correlated with land cover and land use change. The ecosystem benefits of creating new planted forests depends on the previous land-use. Planted forests development derived from non-forest land provided positive attributes to carbon stock, biodiversity, and prevent erosion through sediment

retention. Although water yield from planted forests might be decreased, water quality might be positively correlated.

The provision of ecosystem services at a landscape scale depends on the changes occurring in natural forests and the agricultural landscape. These changes need to be incorporated into ecosystem services assessments. The management regime of planted forests also affect the provision of ecosystem benefits. Close examination of different management systems, particularly the type of management that might improve conditions for water or biodiversity, is needed to develop a more complete understanding of the ES from planted forests.

7.3 Objective 3. Build a network for policy learning and capacity in plantation sector policy analysis, development and implementation in Lao PDR and Viet Nam

7.3.1 Policy forums

Plantation Policy Forums with key stakeholders in national and provincial government, industry and non-government organisations in both countries in March 2016 and March 2017 and in June 2018. Project Advisory Group meetings in Lao PDR and Viet Nam were held in conjunction with these forums. Forum reports are posted on the project website (https://Lao PDR-vietplantation.org/).

7.3.2 Training Workshops

For details on Training Workshops see section 5.3.3.

Project collaborators (approximately 20 people) were trained in semi-structured interview and household survey techniques and have been able to use these skills to interview key stakeholders and carry out field research.

7.3.3 Postgraduate training

Post-graduate training was an integral part of the project. The project team provided supervision and supported field work expenses for a PhD student at ANU, Alex van der Meer Simo. His work has been reported extensively in this report. Alex has produced journal publications and his thesis will be completed in 2019.

The project also supported research projects for five masters coursework students at the University of Melbourne, ANU and Justus Leibig University in Germany. A brief summary of their research is provided here.

Citroen, S. 2016. *Divergence: understanding local-level outcomes of smallholder forestry sector development; A village-level case study of the Forest Sector Development Project, Hoa Cat and Phu Tuyen villages, Thua Thien Hue Province, Viet Nam*. Master of Development Studies research project, University of Melbourne.

This research examined the impacts of the World Bank Forest Sector Development Program (FSDP) investment to alleviate poverty through smallholder plantation development in central Viet Nam. The study found that poverty is underpinned by a ‘constellation’ of socio-historical dynamics and that social schisms between urban and rural migrants in the study villages resulted in a divergence between program objectives and local-level outcomes. The FSDP participant selection criteria and the actions of local decision-makers served to protect the broader community’s interest and kept intact the de facto land ownership system which excluded the poorest and most marginalised households (the landless) from the program. This was because the FSDP was unable to disrupt the social dynamics around land, specifically the pre-existing ‘de facto’ land system and wealth hierarchy for the poorest households and resulted in relatively little

change in experiences of poverty. The program exacerbated tensions between households and the state over land claims; and increased the difficulties for households to securing land rights from the state. Opportunities for employment in the forestry sector are limited in the extent to which they may help the poorest households because they are unstable and seasonal sources of income.

This indicates significant barriers for the poorest households in engaging with the smallholder forestry sector in a way that provides poverty alleviation benefits. These can be addressed through program design relating to access to land and finance and potentially fostering their expressed desire to improve their livelihood through means other than smallholder forestry. More generally, research on smallholder forestry needs to look outside the technical categories through which it is often framed and consider interventions that account for the complex social and historical dynamics surrounding poverty at the local-level.

Carmichael, E. 2017. *Improving policy and regulation for smallholder tree plantations in Lao People's Democratic Republic*. Master's Thesis, Australian National University.

This study found that while the primary policy objective for supporting smallholder plantations is poverty reduction, they are also targeted at environmental policy objectives, such as increasing and protecting forests cover, reducing land degradation and as alternatives to shifting-cultivation or unsustainable or illegal logging of natural forests. The contribution of smallholder plantations to achieving these objectives is viewed positively and their potential to contribute to a more extensive set of policy objectives, such as carbon sequestration and climate change mitigation, are increasingly recognised.

Smallholder plantations are not generally considered to have significant negative environmental impacts and as such few specific regulations have been developed or implemented in this area. However negative impacts do occur at the local level; fire and soil erosion are of concern to farmers. While past programs to promote the planting of trees by farmers has been successful, they do not ensure good plantation management or timber production and the harvest and sale of wood. As a result, many plantations are not reaching their production potential. Smallholder-owned plantations are vulnerable to changing land and commodity markets, driven by infrastructure development and global crop booms. In times of need farmers may opt to sell their plantations and land, or move from longer-term tree-based systems to short term agricultural crops which provide a more regular income stream.

Together these factors impact the sustainability of smallholder -based plantations systems and desired policy objectives, for example forest cover gains, may not be met. The disaggregated nature of smallholder plantations and the diversity in ownership makes the development of a coordinated policy approach to promoting environmental benefits and minimising negative impacts more difficult. Measures to address this, such as through markets for certified wood, have had limited success. New mechanisms and incentives are needed to ensure the provision of public good environmental benefits through smallholder plantations such as:

- reducing or removing regulatory fees and costs associated with plantation harvesting and sales,
- providing information and extension on plantation management understory management and fire control and enforcing fire prevention regulations,
- removing regulatory hurdles to the sale of small products derived from plantation thinning to improve plantation management practices and provide an intermediate income to farmers,
- providing free seeds/seedlings to discourage conversion to other cropping systems, and
- land use rights or tax exemptions that encourage farmer to plant trees on other land where plantations are currently located on high quality agricultural land.

Nga Thi Ha 2018. Investigating the Role of Market Incentives and Local State Actors for Group Forest Certification in Viet Nam. Master of Public Policy, Crawford School of Public Policy, ANU

the Forest Stewardship Council (FSC) has operated in Viet Nam over last 20 years with a goal to maximise environmental benefits, smallholder income, and broader economic benefits of plantations, However, despite of number of adjustments, the practical role of FSC with respect to meaningfully engagement and benefit creation for small-scale plantation owners in Viet Nam is still questionable. There are currently about 5,000 ha. FSC certified belonging to smallholders in Viet Nam, under the five group certificates awarded, with about 230, 000 ha. in total national certified forests up to June, 2017 (FSC, 2017). This achievement arguably represents a significant underperformance by FSC in Viet Nam, given the considerable amount of donor subsidies and Viet Nam Government support that has been provided. In fact, some actors such as forestry experts questioning the future of smallholder forest certification in Viet Nam and indeed in Southeast Asia more broadly. This study focused upon a comparative case analysis of group certification processes for smallholders in two central provinces in Viet Nam, the Quang Tri and Thua Thien Hue. This study aimed to understand the current opportunities and challenges of group certification in Viet Nam, namely as involving the important role of provincial actors and local state institutions.

Current hierarchical structures of the Viet Namese government significantly constrain the development of FSC forest certification for smallholder initiatives. Provincial governments, with strong political powers and authorities, act as crucial sources of influence over FSC Group Certification development for smallholder plantation growers in Viet Nam. This ‘political’ aspect deserves more attention from associated actors who aim for support smallholders in applying for market-based forest certification, particularly where the ‘market driver’ is not strong, there are relatively modest monetary incentives, and the external support from international NGOs and donors is decreasing.

Held, B. 2018. Plantation Forests in Lao PDR- Analysis of Ecosystem Services. Masters student Justus Leibig University, Geissen, Germany.

Land use intensification is causing loss of natural forest cover and is leading to a loss in ecosystem services. At the same time the interactions between ecosystems are poorly understood and are often not considered in decisions regarding future land use. Human induced changes are affecting the provision of ecosystem goods and services. This is including the extensive establishment of plantations and intensification of agricultural production. This study aims to support decision makers to understand the sensitivity of ecosystems to future management options. The key ecosystem services climate regulation and biodiversity were assessed under three different land use scenarios in the case study areas in Salavan and Savannakhet province of Lao Peoples Democratic Republic. These provinces are experiencing a growing demand of plantation forests for production of wood products like lumber, furniture and poles, mainly from neighboring countries such as Viet Nam and China. In this study spatially explicit models were used to map key ecosystem services and define future land use scenarios to support future decision making. Results indicate that decisions in land management for more sustainable land use approaches could help to protect important ecosystems for human wellbeing and that a conservation-based land use approach would result in a higher supply of ecosystem services.

Xi, Luo 2018. Private sector investment models of forest landscape restoration in Southeast Asia. Master of Forest Ecosystem Science, University of Melbourne, small research project.

There is a strong drive in the international community for collaborative actions in forest landscape restoration that balance economic, social and ecological benefits and benefit multiple stakeholders. Participation of the private sector has been stressed for the crucial role it could play and resources it owns. This paper examined the private sector

investment model in the country where public sector is lacking technical and financial capacity of implementing FLR at scale, but with pressing need of recovering forests back to its rural landscapes. With cheap and abundant land and labour as well as good geographic location and natural conditions, Lao PDR has remarkable potential for successful investment. However, in fact, the first movers are left in a challenging situation with the risks of land acquisition to a profitable scale to feed into downstream processing, hidden land conflicts due to low quality baseline information, and repeated failure of native species, as well as challenges from different understanding and expectations with the government, the lack of trust, distorted competition, corruption and culture differences. These highlighted the need of strengthened coordination and cooperation between stakeholders and the role of organisations being a moderator to facilitate the communication and trust building between private and public sector. Impact and enabling investment could build the foundation and enabling environment to leverage broader engagement of profit seeking investors.

Mr Vansy Phengthajaim, who was engaged in research and support activities on the project at the National University of Laos, was successful in his application for an Australia Award and will take up post-graduate studies in Australia in 2019.

Ms Le Thi Thu Ha from Hue University of Agriculture and Forestry worked on the livelihoods analysis component of the project in Viet Nam. She was successful in gaining a scholarship for post-graduate study in Japan and will commence post-graduate studies in 2019. She partly attributes her success to the capacities she developed through being involved with the project.

8 Impacts

8.1 Scientific impacts – now and in 5 years

The project has had considerable scientific impact. The following papers were published in international journals. Others are in preparation.

1- *Baral H, Guariguata MR, Keenan RJ. 2016. A proposed framework for assessing ecosystem goods and services from planted forests. Ecosystem Services. 22:260-268.*
2- *Maraseni TN, Son HL, Cockfield G, Duy HV, Nghia TD. 2017. Comparing the financial returns from acacia plantations with different plantation densities and rotation ages in Viet Nam. Forest Policy and Economics. 83:80-87.*
3- *Maraseni, T. N., Son, H. L., Cockfield, G., Duy, H. V., & Nghia, T. D. 2017. The financial benefits of forest certification: Case studies of acacia growers and a furniture company in Central Viet Nam. Land Use Policy, 69: 56-63.*
4- *Maraseni, T.N., Phimmavong, S., Keenan, R.J., Vongkhamsao, V., Cockfield, G., Smith, H., 2018. Financial returns for different actors in a teak timber value chain in Paklay District, Lao PDR. Land Use Policy 75, 145-154.*
5- *Van Der Meer Simo A, Kanowski P and Barney K. (2018) Revealing environmental income in rural livelihoods: evidence from four villages in Lao PDR. Forests, Trees and Livelihoods: 1-18.*

Submitted for peer review

Phimmavong, S. Maraseni, T.M. Keenan, R.J. and Cockfield, G. Comparing financial returns from three Eucalyptus plantations in Lao PDR

In preparation:

van der Meer Simo, A., Kanowski, P,. Barney, K., 2018. The effects of different models of commercial tree plantations on local livelihoods: a comparative study in Lao PDR

van der Meer Simo, A., Kanowski, P,. Barney, K., 2018. Finding alternatives to corporate-led commercial tree plantations: is smallholder-led agroforestry an option?

Other scientific engagement activities

2016 IUFRO Asia and Oceania Regional Conference

Project team members organised a session at the first IUFRO Asia and Oceania Regional Conference in Beijing on 27 October 2016. The session brought together policy researchers and experts from a number of countries in the region to discuss current problems and best practice approaches to plantation development that best serves the needs of industry, communities, smallholders and the environment. The session was well attended and considered policy issues such as land tenure and allocation processes, regulation and enforcement, finance, incentives and education programs for smallholder plantations, support for domestic processing and value-adding to plantation timber and approaches for integrating environmental values and benefits. Mechanisms for facilitating improved outcomes from plantation development, such as the New Generation Plantations Platform, the role of forest certification and improved policy development and dialogue processes were discussed. Speakers were:

1. Professor Rod Keenan (Facilitator)
2. Dr Anne Toppinen (University of Helsinki) ‘Tree plantations, timberland ownership and control strategies’
3. Dr Tran Lam Dong, Viet Nam Academy of Forestry Sciences ‘Status and future directions for tree plantations in Viet Nam’

4. Dr Peter Clinton, Scion, 'Recent developments in plantation policy in New Zealand'
5. Dr Somvang Phimmavong (National University of Lao PDR) 'Challenges with current plantation policies in Lao PDR'
6. Dr Himlal Baral (CIFOR) 'Tree plantations and ecosystem services'
7. Luis Neves Silva (New Generation Plantations Platform). 'Making tree plantations work for industry, people and environment'
8. Dr Thu Ba Huynh (Rapporteur)

The project sponsored a session at the Fourth International Congress on Planted Forests held in Beijing from 22-27 October 2018. This session brought together policy researchers and experts from several countries to discuss current problems and best-practice approaches to plantation development that serve the needs of industry, communities, smallholders and the environment. The panel session aimed to build on activities and experiences from the research project. Discussion considered policy issues such as: land tenure and allocation processes; regulation and enforcement; finance, incentives and education programs for smallholder plantations; support for domestic processing and value-adding to plantation timber; and approaches for integrating environmental values and benefits.

The program for the session is below.

13.30 – 13.50	Keenan	Australia	Improved policies for planted forests in Lao PDR and Viet Nam
13.50 – 14.10	Paschalis-Jakubowicz	Poland	Forest policy and socio-economics in relation to planted forests
14.10 – 14.30	HL Son	Viet Nam	Policies to support higher quality log production from smallholder acacia plantations in Central Viet Nam
14.30 – 14.50	Huynh	Australia	Multi-dimensional poverty reduction through timber plantations: policy lessons from the central region, Viet Nam
14.50 – 15.10	Mekonnen	Ethiopia	Climate change impacts and adaptation strategies by smallholder farmers in Central Rift Valley of Ethiopia
15.20-15.30			Questions and discussion
15.30 -16.00			BREAK
16.00 – 16.20	Phimmavong	Lao PDR	Impact of forest plantation development in Lao PDR: regional and national level economic modelling analysis
16.20 – 16.40	Maraseni	Australia	Timber value chain analysis (VCA) in Viet Nam and Lao PDR
16.40 – 17.00	Zhang	USA	Costs of delayed reforestation and failure to reforest Zhang Daowei China
17.00 – 18.00			Panel discussion

New Generation Plantations Platform meetings

The NGP platform is a global consortium of plantation industry actors, NGOs and academics that provides a place to learn about better plantation management through real world experiences, and influence others to follow good examples. NGP brings together leading plantation companies and some government agencies that manage and regulate plantations. The Platform holds events such as study tours, workshops and conferences to share knowledge about good plantation practices and learn from others' good

examples. The platform seeks to influence other companies and governments to make environmentally and socially responsible decisions on their plantation management.

The Platform held an event in Lao PDR in October 2016 and project team members Dr Somvang Phimmavong from NUoL and Mr Alex van der Meer Simo from ANU attended and presented on project activities. This resulted in Platform members being better informed on the impacts and benefits of plantations for local communities.

Other

Dr Keith Barney gave a presentation at the 2018 Association of Asian Studies Conference in Washington DC. "*Border Disputes, Village Leases, and Jap Jong: Dispossession and New Livelihood Trajectories in Three Southern Lao PDR Communities*".

Alex van der Meer Simo presented at the 7th Spanish Forestry Congress in 2017 under *'Communication and Dissemination Activities'*.

The longer-term impact will be felt with 5 more journal papers planned from project outputs. A number of these are being led by researchers in Lao PDR and Viet Nam.

8.2 Capacity impacts – now and in 5 years

Training in policy research was conducted in Hanoi on 24 March 2017. Twenty participants from forest research institutes, government agencies and universities attended. Participants indicated a high level of satisfaction with the content of the training. Participants were able to apply the skills developed in these workshops to facilitate discussion and activities in the policy forums in each country the following day.

Project collaborators (approximately 20 people) were trained in semi-structured interview and household survey techniques and used these skills to interview key stakeholders and carry out field research.

Training in forest economic research was conducted in Hanoi on 18 June 2018 and in Vientiane on 22-23 June 2018. In Hanoi, twenty-two participants from forest research institutes, government agencies and universities attended. Thirty participants from NUoL; different GOV agencies; companies and NGOs in Lao attended. The training introduced the concept of forest resource economics; assessment of forest investment enterprise or household level; economy wide assessment of forest investment and household level analysis. Approximately 82% of the participants thought that the knowledge on forest economics from the training is useful for their work, and 80% felt the quality of training was very good.

The project has clearly increased the knowledge of participating researchers in the approach to evidence-based policy development. For all partners, bringing together the researcher community, administrators, international actors and private sector in an open forum, with a strong evidence base, has been a new experience for most participants.

The project has significantly improved the knowledge of staff (and some students) at Hue University of Agriculture and Forestry. Through participation in the livelihoods research, they benefited from training, and practical experience in data collection and analysis. The research methods have influenced their teaching materials, and provided them with valuable experience to contribute to future GOV of provincial Government funded projects.

The economics team at VAFS have improved their capacity through the partnership with USQ. The Viet Nam partners have enhanced their understanding of Forestry Supply Chains beyond the establishment of plantation. Through this new capacity and partnership, Dr Son from VAFs together with USQ were successful in obtaining a research grant from ITTO for $400KUS$600K for supply chain partnership studies.

IPSARD had previously done little work in forestry prior to this ACIAR project. Through this project they have increased their knowledge of the forestry sector and have increased capacity to respond to GOV enquiries.

The project was also able to build capacity of staff based in a regional centre for VAFS (Quang Tri) through their participation in the fieldwork (Phoung, Son and Quang).

8.3 Community impacts – now and in 5 years

The project is not primarily aimed at community level benefits. The project has provided an opportunity for sharing between industry and government participants on the benefits and impacts of plantations to local communities and mechanisms for addressing community concerns. The project puts an emphasis on information sharing during field research, to assist with decision making and legitimizing local views and support at community level.

The project researchers have been active in providing input to draft laws and regulations. The project recommendations have potential to be translated into policy or strategy statements in Government documents and guide development Laws, or supporting instructions such as decrees and orders. Through participation of key actors involved in policy discussions, the project outputs have a reasonable potential to influence future plantation outcomes (within the next 5 years).

In Lao PDR, promotion of policies that support investment by companies with high corporate social responsibility would see an increase in forest cover, and increased employment and equity opportunities for smallholders. If the articles in the Forest Law that have been revised following advice facilitated by the project team are adopted (as expected), this will provide less regulation and greater economic benefits to producers. This is a significant outcome.

8.3.1 Economic impacts

The anticipated economic impacts from the project will occur with adoption of policy proposals and integration of project findings into laws, regulations and new policy instruments to support plantation investment and sustainability. These will include:

1. Increased investment in plantations in Lao PDR. Achieving the Government's new goal of one million hectares of plantations.
2. Increased benefits for communities and individual landowners, through income from labour and sale of timber, in both countries.
3. Increased value adding to plantation timber in Viet Nam.
4. Increased returns to plantation growers in both countries, with market benefits.

In Lao PDR, implementing project recommendations would lead to greater social benefits from forest plantations through greater profitability for smallholders, private companies and potentially greater domestic value from the plantation forestry sector. Improved policy settings could lead to better environmental protection associated with forest plantations and an increased understanding, management and reward for the environmental services they have the potential to provide.

In the medium term 5-10 years, in Viet Nam, with an increased understanding by smallholders of the profitability and risks of extending rotation ages, financial returns may be significantly increased. In the medium to long term, introduction of PES schemes may lead to enhance profitability.

The project had good engagement with the private sector: in Lao PDR with Stora Enso Lao PDR Ltd, Burapha Agroforestry Ltd and Birla Lao Ltd; and with companies in the study areas in Central Viet Nam (in particular Ben Hai FSC and FOREXCO Quang Nam) and through the Viet Nam Timber and Forest Product Association (VIFORES) and Handicraft

and Wood Industry Association in HCMC (HAWA). Ben Hai company in Quang Tri Province reported learning from the researchers and used this knowledge to better understand their business. They have been able to use the project outputs and models to build an investment case to borrow from the bank for plantation investment.

8.3.2 Policy impacts

The project has had significant policy impact in both countries. Country partners, NUoL, NAFRI and VAFS are actively engaging in policy processes in Laos and Viet Nam and have been the key agents/catalysts in delivering policy changes. A strong research-policy partnership was formed early in the project and has been maintained and enhanced through knowledge sharing and policy forums.

In Laos, project outputs are being used to inform revision of the Forestry Law. Outputs are also informing revision and implementation of Decree No. 96/PM (2003) on Industrial Tree Plantations and Environmental Protection and PMO 13 on plantation concessions. The Department of Forestry is also developing the country's plantations strategy. The project team provided input to this review and this has been used to inform their approach. This was largely due to relationships formed during the project, and other ACIAR projects, and the role played by project member Hilary Smith in coordinating input to the Lao Government on behalf of a group of international organisations. This pathway to input to Lao Government processes from international actors is not common, and the project team demonstrated that it has the knowledge and relationships with other actors to coordinate this feedback. A Technical Workshop on the Legal Framework for Tree Plantations in Lao PDR, organised in conjunction with GIZ in October 2018, was a further demonstration of this coordination capacity. Participants acknowledge the role played by Dr Smith and Dr Somvang Phimmavong of NUoL in facilitating this landmark meeting that raised awareness in Government of current issues and identified pathways forward new laws and regulations for plantations. The workshop outputs will improve the legal framework for plantation investment, by smallholder growers and foreign investors. Company representatives involved in project have seen a marked change in the Government's approach and policies on forest plantation investment. They attributed this, in part, to the influence of ACIAR's work. This can potentially assist in expanding investment by the Australian based firm New Forests in plantation assets in southern Lao PDR.

Specific changes to laws and regulations resulting from the project include:

- Revised articles to give owners of some plantations (exotic species) the right to harvest their trees, where previously they had to seek permission prior to harvest. The requirement for the government to undertake a pre-harvest inventory paid for by the grower is now no longer required for all plantation owners.
- Changes to the articles on Domestic Transportation and Export of Planted Wood clarifies that owners of exotic planted trees can transport them without a permit, where previously they had to get one from a) Department of Agriculture and Forestry and/or b) Department of Industry and Commerce.
- Changes to regulations on registration of forests, and the need to update subordinate regulations; this is ongoing.
- Revised articles on Activities of Planting Trees and NTFPs in the Forest Law that attempts to clarify who has the right to approve tree planting on different types of forest land. The application of this law will allow greater profitability to smallholder produces through reduced costs of production and more open market.

Outputs from the project used by World Bank staff in Lao PDR in developing an analytics report in sustainable forest management in Laos. This will be used to inform a future World Bank investment in the forestry sector in Lao PDR. The World Bank and IFC consider the project team active partners, and highly value the knowledge the project has generated its usefulness.

In Viet Nam the project provided background to decision 886, the Target Program for Sustainable Forestry 2016-2020, approved in June 2017 and the New Forestry Law, approved in 2017. In July 2018, the project submitted two sets of specific policy recommendations (i.e. Carbon Trading and Longer Rotations Plantations) to MARD for the development of a new decree to guide the implementation of the Forestry Law. This can form the basis for improved engagement with small-holders to shift their plantations from short rotation for woodchip to longer rotation for saw log in order to meet the domestic demand for timber processing into products for domestic and export markets. With the PM Decree 886 on National Target Program on Sustainable Forest Management, there will be further development of regulations and, with appropriate advocacy, the outputs from this project will be influential in forming these regulations.

The policy briefs developed by the project team have been useful tools for elaboration of issues during workshops and policy dialogues. These will be presented by project partners for wider dissemination within national academic and Government actors.

In Viet Nam the project contributed to discussions prior to finalisation of the new Law on Forestry (2017) and Strategy for Sustainable Forest Development. Project outputs will contribute future decrees on Forest Policy for 2020-2025 with an orientation to 2030. VNFOREST will lead this development and establish a working group in 2019. This will be an opportunity to further apply policy recommendations.

8.3.3 Environmental impacts

Environmental impacts consequent to the project are those associated with changes to policies and operational practices. Working Paper 3 on environmental management and protection measures in Lao PDR was used to inform a review of the Decree on Environmental and Social Impact Assessment (ESIA) in Laos and is being in ongoing discussions on the development of supporting guidelines for ESIAs for plantations. The paper by Baral et al (2016) established an analytical framework for the impacts of planted forests on ecosystem goods and services. The thesis by Carmichael provided an analysis of policy requirements to reduce environmental impacts in La PDR. Application of this framework and thesis findings can be expected to lead to decisions that reduce the environmental impacts of plantations and greater understanding of the risks from smallholder plantations in the development of certification standards for plantations in Laos. The thesis by Ha provided useful insights into the role of the state in certification activities. and results will be useful for the ongoing development of a certification system for Viet Nam.

8.4 Communication and dissemination activities

The project team maintains strong internal and external communication channels with key policy makers and with industry. The project has been able to help define new issues for policy discussion (for example, carbon trading) and supporting current policy issues (i.e. forest certification). The project presented and contributed to the ACIAR Symposium in Hanoi in September 2017.

A website provided for communication of outputs as they became available, although there were some problems with site security and availability. These have been rectified and all project publications will be available at (https://laos-vietplantation.org/).

The following meetings were held as part of project planning and communication.

- A meetings with project partners and high-level government and NGOs in Viet Nam to introduce the project and discuss key objectives in Hanoi, 7-11 November 2015.
- Plantation Policy Forums with key stakeholders in national and provincial government, industry and non-government organisations in both countries in March 2016 and March 2017 and in June 2018. Project Advisory Group meetings in Lao PDR and Viet Nam were held in conjunction with these forums.

- A meeting of 30 key plantation sector stakeholders was organised on 23 March 2018, in Vientiane in partnership with ACIAR project ADP/2014/017. The meeting included a 'stock-take' of plantation sector activities and projects in Lao PDR, including some short presentations, and discussed key issues related to the plantation sector. The meeting discussed whether there was interest in the establishment of a plantation sector group and it was noted that the establishment of a group of 'plantation companies' has already been facilitated by IFC. This group is not representative of the sector and does not include government and nongovernment (CSO) organisations nor development partners
- Discussions/interviews with policy actors and other industry stakeholders at national and sub-national levels contributed to facilitating information sharing at all levels. Outputs from this process were discussed in Project Steering Committee in December 2017 and 2018.
- Meetings, of the Project Steering Committee members twice a year (at annual Steering Committee meetings and in each country at the policy forums). These included informal social activities and field trips and provided for regular and consistent interaction and the development of relationships based on trust, mutual respect and deeper understanding of the policy issues and challenges between the representatives from the two countries and with the researchers.

In Laos, Dr Hilary Smith provided a strong link between related ACIAR projects, and this dual role enabled her to spend more time in country. When combined with her other work for GIZ and the World Bank, this frequent presence greatly improved engagement with the Government of Lao PDR and with inter-governmental organisations in Vientiane. This allowed the project to present a more visible presence and to engage with other actors in the sector. Together with the increasing capacity and confidence of the Lao project coordinator, Dr Phimmavong, their presence developed trust with government and greater for influence in Laos on matters such as the new Forestry Law Having key researchers working across related projects in this way provides a highly effective mechanism for integration and knowledge sharing.

In Viet Nam, Dr Phuong, Dr Nghia Dr Son had ongoing regular engagement with policy makers in MARD and VN Forests. This provided a conduit for presentation of project results and discussion about the implications. Results were also presented in articles in the Viet Nam agricultural media.

9 Conclusions and recommendations

9.1 Conclusions

Governments in Lao PDR and Viet Nam have objectives for plantations to improve local livelihoods, alleviate poverty, provide opportunities for smallholder growers to produce resource for domestic processing industries and to improve environmental outcomes of plantations. The aim of this project was to provide policy options that achieve these national goals and improve linkages between commercial investment and smallholder production.

This led to a well-designed project that met its goals. The project was very timely with restructuring of the forestry sector in Viet Nam and review and redrafting of the Forestry Law and other regulations in Lao PDR. A scoping study was a very useful to better identify partners and research issues. An independent review panel found that the project was well-managed with positive and effective collaboration between all the partners. This collaboration was built on more than a decade of investment in research and capacity building by ACIAR and other donors in both countries. Committing significant funds to a project coordinator (Dr Thu Ba Huynh) facilitated project implementation. Engaging Dr Hilary Smith enabled stronger collaboration with another ACIAR project and with GIZ and the World Bank in Lao PDR, and a more frequent presence in government meetings in Vientiane. Having key researchers working across related projects in this way provides a highly effective mechanism for appropriate integration and knowledge sharing.

The project activities were largely implemented as planned and the expected outputs were delivered. The project has been particularly effective at facilitating collaboration and participation amongst partners and stakeholders in policy development. The project team has supported analysis and discussion on plantation models that benefit communities and smallholder producers and engaged effectively with other international actors. Strong participation and advice from the Project Steering Committee from early in development of the project led to responses to emerging policy demands. For example, in Viet Nam, the project team utilised expertise from the Australian team in climate change mitigation policy and PES to consider policy options and recommendations for the increased carbon storage in plantations that helps meet the goals of increasing higher value sawlog production.

Including both countries provided for an exchange of knowledge, case studies and experience (and differences) between both researchers and policy makers in both countries. Cross-country collaboration between researchers provided for sharing methods and capacity (such as input-output studies).

Policy forums were a key contributor to the success of the project. The three annual forums in each country were well attended and developed networks of key actors that supported knowledge sharing between countries. These forums built shared understanding of issues, presented emerging evidence, and considered policy options to address key issues. Through these forums and other mechanisms, the project has successfully introduced new approaches to policy development. The project delivered training in policy and economic analysis, livelihood data collection and analysis and supply chain analysis. Participating researchers spoke highly of the new knowledge they had acquired on research methods that will allow them to better support other provincial and national government programs. The training on supply chain analysis was a significant improvement on past activity. Results have been presented at international conferences and related initiatives by project team members from all partner organisations.

The project found that in Viet Nam, plantation development improved livelihoods and wellbeing of smallholder growers and communities, but the poorest groups have not benefitted as much, and their asset base may be inadequate, unstable and risky. In Lao

PDR, many of the forest and broader development related strategies are underpinned by target-driven indicators that may send a clear signal of commitment, but which may not be particularly useful in understanding policy effectiveness or in pointing to areas that need reform. For example, the plantation area target has become a key indicator of success, but this provides little indication of whether policies for plantation development are achieving their desired objectives.

In Lao PDR, under the right conditions, foreign investment in plantations has significantly improved local incomes and provided wider community benefits. These outcomes require local participatory planning to identify suitable land, engaging local people in regular, appropriately-paid employment, providing lease payments to community members and satisfactory contributions to community development funds. Unless these conditions are in place, some households can earn equivalent or greater incomes from traditional uses of degraded forest-lands or be worse off with plantation projects. To maximize the local benefits from tree plantation investment, plantation companies and governments should adopt local landscape planning that recognises diverse local land-uses. Investors should ensure a fair share of local income through employment and land lease payments and improve communication and collaboration between communities and private companies in timber production and forest conservation.

The project has demonstrated **policy relevance and impact** on new laws and policies. Good design, strong engagement and collaboration between researchers and government, industries, NGOs and practitioners across the three countries has led to new relationships and new thinking about plantation challenges contributed to the success of the project. Combining livelihood and financial studies provided a stronger contribution to policy dialogues. The evidence collected during these activities added a depth to the discussions which local country partners had not normally considered to the same degree.

9.2 Recommendations

Policy recommendations are presented in Sections 7.1.3 and 7.1.4 of this report.

Given the positive reception of the research by policy makers, the success in investigating forest policy issues and the capability developed in the two countries in forest policy, economics and rural development research, it is recommended that ACIAR continue to support forest policy research in the East Asia region and expand this activity to include surrounding countries.

Policy development for forest plantations remains active in both Lao PDR and Viet Nam. The Independent Project Review Panel recommended continuing aspects of the project to maximise the impact and benefit of project research. This includes the following:

- Analysis, input and advice to the Lao PDR government on new Forest law and related decrees and regulations on plantations
- Analysis, input and advice Viet Nam on development of policies and regulations and on the National Forest Certification Scheme.
- Policy briefing/forums in Viet Nam to present findings to key stakeholder group; DG of VNFOREST, Vice Minister, in both MARD and MONRE and to Viet Nam Forest Protection and Development Fund (VNFF) on carbon sequestration in forest plantations and opportunities for PES. Policy forums and briefings will involve interested members of the public, including students, academics, NGOs and international organisations.
- Policy briefing/forum in Lao PDR to present findings to a key stakeholder/Vice Minister in MAF and disseminate project outputs, policy briefs. This will include policy dialogue with high level actors within MAF (VM, DG) and the Prime Minister's office, and engagement with other donors and private sector actors to influence policy and program design, implementation and investment decisions. Policy forums and

briefings will include interested members of the public, including students, academics, NGOs and international organisations.

- Project website hosted by the University of Melbourne or the National University of Lao PDR for project implementation, and repository for project literature, the grey literature and peer-reviewed literature.
- Revised and improved studies of regional and national economic benefits of plantations and industry development.

Future research in this area could focus on:

- Policies and tools to facilitate Public Private People Partnerships (PPPP) for integrated forest plantations and landscape restoration.
- Development of codes of practice and forest certification.
- Risk management (such insurance or compensation payments) to support smallholder growers to grow longer rotation and higher value logs.
- Design of incentive payments to support smallholder growers to grow longer rotation and higher value logs, including potential use of carbon markets.

10 List of publications produced by project

#	Report type	Name	Date
1	Journal article	A proposed framework for assessing ecosystem goods and services from planted forests. Baral, et al 2016. Ecosystem Services. 22:260-268.	2016
2	Journal article	The financial benefits of forest certification: Case studies of acacia growers and a furniture company in Central Viet Nam. Maraseni, et al. 2017. Land Use Policy 69, 56-63.	2017
3	Journal article	Comparing the financial returns from acacia plantations with different plantation densities and rotation ages in Viet Nam. Maraseni et al. 2017. Forest Policy and Economics 83, 80-87.	2017
4	Journal article	Financial returns for different actors in a teak timber value chain in Paklay District, Lao PDR. Maraseni, et al. 2018. Land Use Policy 75, 145-154.	2018
5	Journal article	Phimmavong et al 2018. Comparing financial returns from three Eucalyptus plantations models in Lao PDR. Land Use Policy (under review)	Apr 2019
6	Working paper 1	Tree Plantations in Lao PDR: Policy Framework and Review	2017
7	Working paper 2	Tree Plantations in Viet Nam: Policy Framework and Review	2017
8	Working paper 3	Tree Plantations in Lao PDR: Environmental management and protection measures	2017
9	Working paper 4	Tree Plantations in Viet Nam: Environmental management and protection measures	2017
10	Working paper 5	Forest Plantations and Smallholder Livelihoods: Evidence from Community Case Studies in Lao PDR	Apr 2019
11	Working paper 6	Forest Plantations and Smallholder Livelihoods: Evidence from Central Region of Viet Nam	Apr 2019
12	Policy brief	Initial Lao PDR Plantation Policy Assessment No. 1: The role of plantations to increase forest cover, foster sustainable forest management and economic development in Lao PDR	Mar 2017
13	Policy brief	Initial Lao PDR Forest Plantation Policy Assessment No. 2 Industrial Tree Plantations: Examining Their Effects and Contribution to Livelihoods	June 2017
14	Policy brief	Initial Lao PDR Forest Plantation Policy Assessment No 3. Regional and national economic benefits of different	Mar 2017

		plantation development approaches	
15	Policy brief	Initial Lao PDR Plantation Policy Assessment No 4. Environmental impacts and benefits of different plantation development approaches	Mar 2017
16	Policy brief	Initial Viet Nam Plantation Policy Assessment No. 1: Supporting Sustainable Forest Management in Smallholder Plantations	Mar 2017
17	Policy brief	Initial Viet Nam Plantation Policy Assessment No. 2: Smallholder plantations and certification	Mar 2017
18	Policy brief	Initial Viet Nam Plantation Policy Assessment No. 3: Building Bridges: REDD+ and Tree Plantations	Mar 2017
19	Policy brief	Initial Viet Nam Plantation Policy Assessment No. 4: Value chain partnership models and cooperatives	Mar 2017
20	Policy brief:	Regulation for investment in tree plantations in Lao PDR.	June 2018
21	Policy brief:	Improving environmental outcomes from forest plantations in Lao PDR and Viet Nam: regulations and forest certification	June 2018
22	Policy brief:	Social Outcomes from Tree Plantations Development in Lao PDR: Evidence from 6 Villages	June 2018
23	Policy brief	Smarter regulation of plantation wood value chains in Lao PDR	June 2018
24	Policy brief	Land Tenure, Zoning, and Compensation in Tree Plantations Development in Lao PDR	June 2018
25	Policy brief	Increasing log value from Acacia plantations in Viet Nam	June 2018
26	Policy brief	Multi-dimensional Poverty Reduction through Timber Plantations: Policy Lessons from Central Region, Viet Nam	June 2018
27	Policy brief	Carbon rights and trading in Australia: lessons for Lao PDR and Viet Nam	June 2018
28		**The following Activity Reports are combined in a 'Report to final workshop, Dec 4-5, 2018.**	**Dec 2018**
29	Activity report	Activities 1.3 and 2.2. Plantation Supply Chain and Financial Analysis	Dec 2018
30	Activity Report	Activity 1.5a Policy Options for Forest Plantations in Viet Nam	Dec 2018
31	Activity	Activity 1.5b Policy Options Paper – Lao PDR	Dec 2018

	Report		
32	Activity Report	Activity 2.1 Forest Plantations and Smallholder Livelihoods in Lao and Viet Nam	Dec 2018
33	Activity Report	Activity 2.3a. Economy-wide Effects of Plantation Development in Viet Nam	Dec 2018
34	Activity Report	Activity 2.3b Regional Economic Effects of Forest Industries Lao PDR	Dec 2018
35	Activity Report	Activity 2.4 Ecosystem services from planted forests in Central Viet Nam	Dec 2018
36	Forum report	First Plantations Policy Forum Report, 22 March 2016, Vientiane, Lao PDR	Apr 2016
37	Forum report	First Plantations Policy Forum Report, 25 March 2016, Hanoi, Viet Nam	Apr 2016
38	Forum report	First Plantations Policy Forum Report, 21-22 March 2017, Vientiane, Lao PDR	Apr 2017
39	Forum report	Second Plantations Policy Forum Report, 24 March 2017, Hanoi, Viet Nam	Apr 2017
40	Forum report	Third Plantations Policy Forum Report (including economic training) 20-22 June 2019, Vientiane, Lao PDR	Jul 2018
41	Forum report	Third Plantations Policy Forum Report (including economic training) 18-19 June 2019, Hanoi, Viet Nam	Jul 2018
42	Meeting report	Steering Committee Report, 17-18 January 2017, Hue, Viet Nam	Feb 2018
43	Meeting report	Project Steering Committee Report, 5-6 Dec 2017, Luang Prabang, Lao PDR	Jan 2018
44	Meeting report	Project Steering Committee Report, 6-7 Dec 2018, Da Nang, Viet Nam	Dec 2018
45	Annual Report	Annual report to ACIAR for 2015-16	Jul 2016
46	Annual Report	Annual report to ACIAR for 2016-17	Jul 2017

47	Annual Report	Annual report to ACIAR 2017-18	Jul 2018
48	Student Thesis	Divergence: understanding local-level outcomes of smallholder forestry sector development; A village-level case study of the Forest Sector Development Project, Hoa Cat and Phu Tuyen villages, Thua Thien Hue Province, Viet Nam. S. Citroen, University of Melbourne	2016
49	Student Thesis	Tree Plantations in Lao PDR: Environmental management and protection measures. E. Carmichael. ANU	2017
50	Student Thesis	Investigating the Role of Market Incentives and Local State Actors for Group Forest Certification in Viet Nam. Master of Public Policy, Nga Thi Ha. Crawford School of Public Policy, ANU	2018
51	Student Thesis	Private sector investment models of forest landscape restoration in Southeast Asia. Xi, Luo. Research project report. Master of Forest Ecosystem Science, University of Melbourne.	2018
52	Student Thesis	Plantation Forests in Lao PDR- Analysis of Ecosystem Services. Held, B. Masters thesis Justus Leibig University, Geissen, Germany.	2018

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