

## 9 Promises and perils of plantation forestry

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Plantation forestry is an increasingly important part of the global forestry industry. In the decade to 2010, global expansion of planted forests averaged five million hectares (ha) annually, mostly through afforestation of land that had not been recently forested (FAO 2010). This rate of expansion is substantially higher than in previous decades (FAO 2010) and is happening worldwide, as shown in Table 9.1, although more than half of all planted forests are located in just five countries (China, the United States, the Russian Federation, Japan and India). Within this global snapshot, there are very different trends: countries such as China (Xu 2011) and Vietnam (Government of Vietnam 2011) are pursuing rapid growth of tree plantations, while in much of North America and Europe there is a large existing plantation estate and more limited expansion (FAO 2010).

Of the estimated 264 million ha of planted forests established globally by 2010, around three-quarters had commercial wood production as their predominant purpose (FAO 2010). Plantations are of growing importance to global timber supply, in part because of declining wood production from natural forests (Warman 2014). Plantations are estimated to contribute, currently and for the foreseeable future, around one-third of industrial wood supply (Barua *et al.* 2014; Jurgensen *et al.* 2014). The supply of industrial roundwood from plantations could increase to 1.5 billion m<sup>3</sup> in 2050, but even at this volume is expected to contribute only around one-third of global wood supply (Barua *et al.* 2014).

Depending on the scenarios used, planted forests are predicted to cover anywhere from 303 to 345 million ha by 2030, with most of the absolute increase taking place in Asia, as can be seen in Table 9.1 (Carle and Holmgren 2008; Warman 2014). Plantations established for industrial roundwood production are likely to dominate, although plantations are increasingly being established for other commercial purposes, with an estimated 403,000 ha of plantations established for commercial carbon sequestration worldwide by September 2011 (Diaz *et al.* 2011), and a growing area of plantations established for biofuel production (Pin Koh and Ghazoul 2008; Arevalo *et al.* 2014).

Table 9.1 Where are the plantations? Area and rate of growth of planted forests by region and country

<i>Region/country</i>	<i>Area of planted forest, 2010 (1 000 ha)</i>	<i>Average annual rate of afforestation, 2005<sup>a</sup> (1000 ha/yr)</i>	<i>Average annual change in area of planted forest 2005–2010<sup>a</sup> (1000 ha/yr)</i>
South Africa	1763		3
<b>Eastern and Southern Africa</b>	<b>4116</b>	<b>49</b>	
Sudan	6068		43
<b>Northern Africa</b>	<b>8091</b>	<b>53</b>	
<b>Western and Central Africa</b>	<b>3203</b>	<b>48</b>	
<b>Total Africa</b>	<b>15409</b>	<b>150</b>	
China	77157		1988
Japan	10326		No data
Republic of Korea	1823		0.5
<b>East Asia</b>	<b>90232</b>	<b>4385</b>	
India	10211		145
Indonesia	3549		–30
Malaysia	1807		47
Thailand	3986		108
Vietnam	3512		144
<b>South and Southeast Asia</b>	<b>25552</b>	<b>398</b>	
Turkey	3418		160
<b>Western and Central Asia</b>	<b>6991</b>	<b>142</b>	
<b>Total Asia</b>	<b>122775</b>	<b>4,926</b>	
Belarus	1857		20
Czech Republic	2635		2
Finland	5904		0
France	1633		5
Germany	5283		0
Hungary	1612		9
Norway	1475		15

<i>Region/country</i>	<i>Area of planted forest, 2010 (1 000 ha)</i>	<i>Average annual rate of afforestation, 2005<sup>a</sup> (1000 ha/yr)</i>	<i>Average annual change in area of planted forest 2005–2010<sup>a</sup> (1000 ha/yr)</i>
Poland	8889		24
Romania	1446		8
Russian Federation	16991		6
Spain	2680		26
Sweden	3613		0
Ukraine	4846		12
United Kingdom	2219		6
<b>Total Europe</b>	<b>69318</b>	<b>169</b>	
<b>Caribbean</b>	<b>548</b>	<b>35</b>	
<b>Central America</b>	<b>584</b>	<b>4</b>	
Canada	8963		183
Mexico	3203		162
United States of America	25363		188
<b>North America</b>	<b>37529</b>	<b>199</b>	
<b>Total North and Central America</b>	<b>38661</b>	<b>204</b>	
Australia	1903		55
New Zealand	1812		-8
<b>Total Oceania</b>	<b>4101</b>	<b>59</b>	
Argentina	1394		38
Brazil	7418		331
Chile	2384		64
<b>Total South America</b>	<b>13821</b>	<b>88</b>	
<b>World</b>	<b>264084</b>	<b>5,595</b>	

Data in this table are for all types of planted forests, including those planted for non-commercial purposes. FAO (2010) estimated that approximately three-quarters of these had commercial timber production as their primary purposes. Only countries with greater than 1 million ha of planted forests in 2010 are included

<sup>a</sup> The FAO have a slightly different definition and calculation for (i) afforestation rates versus (ii) average annual change in area. These statistics are therefore presented in separate columns (the FAO have not produced each type of data for both global regions and individual countries)

Data source: FAO (2010)

There is ongoing debate about the sustainability of tree plantations, making the plantation sector a critical area to consider when examining the opportunities and threats presented by the business activities of the global timber industry. Ensuring sustainability is not only critical to ensuring positive environmental, economic and social outcomes: it is increasingly a critical component of even short-term business viability, particularly as businesses face greater pressure from consumers and risk losing their ‘social licence to operate’ if they are perceived to be operating unsustainably.

In this chapter, we consider the promises and perils of plantations grown for commercial timber production, where ‘timber’ is defined as all forms of roundwood production for commercial purposes. We chose this focus as the global plantation estate is dominated by commercial timber plantations, and there is a larger body of evidence regarding sustainability for these plantations than for other commercial tree plantations, such as those grown for carbon sequestration and biofuel production. We do not examine planted forests established for non-commercial purposes such as addressing environmental degradation, in order to better focus on the tensions between commercial business practice and sustainability.

Business practices in the plantation sector influence sustainability at many points and in many ways. We do not attempt to review all sustainability concerns related to plantations – a task impossible in a single chapter – but focus on key areas that must be considered if timber production from tree plantations is to be a truly sustainable business enterprise. First, we review the debate that has emerged around sustainability of plantations, identifying common sustainability concerns that regularly emerge. We then examine three prominent sustainability challenges in more detail, each of which has emerged in multiple countries: land ownership and tenure rights; deforestation and biodiversity; and employment and communities. Following this we consider the design of plantations and associated governance systems to enable sustainability. First, we examine arguments surrounding the scale of plantations, focusing on whether a shift from large-scale to small-scale plantations is likely to address sustainability concerns. We then consider enabling conditions – the broader social and political conditions that enable the success or failure of plantations from both a business and a sustainability perspective. We conclude by considering future directions: how can appropriate governance and business approaches ensure a successful plantation sector from the point of view of both ensuring viable businesses, and of enabling sustainable development?

### **Plantations and sustainability: A contentious debate**

Plantation forestry is widely promoted for the business opportunities it provides to the timber industry through high rates of wood production and the ability to produce consistent quality timber (Rudel 2009). Plantations are also argued to have the potential to address problems as diverse as rural

poverty, environmental degradation, deforestation and climate change. For example, it is argued that plantations can help address: rural poverty through providing employment and income earning opportunities in rural communities; environmental degradation through reducing logging pressure on natural forests; and climate change through sequestering carbon (Righelato and Spracklen 2007).

However, this positive view of plantation forestry is not shared by all: critics argue that many plantations cause environmental, economic and social damage to rural landscapes and communities. Contention and conflict over plantation expansion has been documented in more than 35 countries, including all of those in which large areas of plantation have been established (Schirmer 2007; Mola-Yudego and Gritten 2010; Gerber 2011). Concerns have been raised about whether local communities receive the economic benefits of plantations; about the environmental implications of planting large areas of a single species; and about whether plantations truly provide the economic returns often promised, to cite just a few examples.

Even the terminology used to discuss tree plantations is contentious, as it helps define what constitutes a plantation. Some argue that the word 'forest' should not be associated with tree plantations, as this may imply they have all the characteristics of natural forests and hence can replace them. At the other end of the spectrum, some use terms such as 'tree engineering' to emphasize the technological and man-made component of plantations. To resolve these issues – and for statistical purposes as well – a new term was proposed by the FAO: planted forests (Del Lungo *et al.* 2006). It covers a range of ecosystems from semi-natural forests where trees were planted, to strictly man-made tree plantations.

In this chapter, we use the terms 'tree plantation', 'plantation forestry' and 'planted forest' interchangeably, together with more specific terms: 'timber plantations' refers to any plantation that produces roundwood for commercial wood and paper production; 'industrial plantations' refers to those established in large areas, managed by a company and aimed at supplying large volumes of roundwood to wood or paper processing facilities; while 'small-holder plantations' refers to small-scale plantations, owned by individual landholders or small cooperatives, which may supply a range of markets from small-scale local sale to large-scale processors.

Debates about the benefits and costs of tree plantations often focus on the sustainability of those plantations – in other words, whether the rapidly growing global plantation estate is being established and managed in a way that 'meets the needs of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development 1987). This requires plantations to be sustainable in terms of their environmental, economic and social impacts, which in turn requires businesses to go beyond focusing on the shorter-term needs of their business to considering issues such as the biodiversity impacts of plantations, the economic flow-on effects of plantation forestry, equity in the distribution of

benefits from the use of land, and access to employment and income earning opportunities. Without this focus on sustainability, business practices can give priority to short-term benefits and high timber production, a focus that can come at the expense of long-term productive use of land and generate negative externalities, such as reduced access to forest products, loss of land for local communities or pollution.

Common debates that have emerged in recent decades about sustainability of plantations are summarised in Table 9.2. Perhaps the most evident fact in Table 9.2 is that polarised views are common, with views about the effects of plantations often contradicting each other. We argue that making global claims about the sustainability of plantations is unwise and unhelpful. In reality, the sustainability or otherwise of a given tree plantation depends on many factors, including the economic relationships involved, the type and location of plantation, previous land uses, the quality of the management of the plantation, quality of governance systems that are in place to oversee planted forests, and of course the unique characteristics of the local communities and landscapes in which the plantation is established. This approach recognises that plantations are not inherently sustainable or unsustainable: their effects depend on the actions of those involved in establishing, managing and governing them.

The importance of examining the specific context and understanding how sustainability of plantations varies even within the same region can be seen by examining the case studies of plantation expansion described in the following pages. In the first, expansion of plantations in the United Kingdom in the 1980s was criticised with regard to environmental sustainability when a combination of factors led to plantations being established on drained areas of peatland. In the second, large-scale plantations in Indonesia have been criticised on environmental, social and economic fronts while small-scale plantations have not been criticised on the sustainability front, but have failed in terms of business success. In the third, however, small-scale plantations in Thailand have achieved reasonable success in terms of providing both a livelihood for thousands of smallholders and also providing a supply of timber supporting a large-scale pulp industry, while receiving little criticism regarding sustainability-related issues, despite an earlier history of conflict over large-scale plantations in the country. These three case studies were chosen because they demonstrate common sustainability opportunities and challenges that have emerged in different countries, together with varying levels of ‘business’ success. They were also chosen because they are well documented – something that remains a rarity, despite the widespread literature variously criticising and promoting plantations. For example, despite widespread discussion of the importance of understanding sustainability of plantations in China, a country where some of the largest scale and most rapid plantation expansion is occurring, there remains little robust, documented research that documents and critically examines claims about many aspects of sustainability of China’s large areas of tree plantations. This and

Table 9.2 Commonly cited benefits and costs of tree plantations

Topic	Benefits	Costs
Land tenure and land markets	Plantations provide a different market for land, which may boost land prices and benefit landholders seeking to sell or lease out their land	Previous land users may be displaced by plantations without compensation or recognition of their claim to their land; or unfair deals for land may disadvantage those who are selling or leasing the land. Plantation expansion may result in increasing land prices that price other land users, such as farmers, out of the market
Employment opportunities	Proponents argue that plantations generate employment opportunities for local people in establishing, managing, harvesting and processing plantations. This is argued to help stem decline in rural populations and provide alternative or diversified income streams for agriculture-dependent communities	Critics argue that the employment generated is often less than that generated by previous or alternative land uses; and that employment opportunities do not necessarily occur in the communities where plantations are established, with many of the jobs created being located some distance away. Concerns have also been raised about worker conditions in some countries
Local population	Provision of employment may result in new people shifting into communities, or retention of people who might otherwise have migrated elsewhere due to lack of local employment opportunities	Displacement of previous land uses by plantations may result in previous land users migrating elsewhere; if plantations provide fewer jobs, this may also be associated with decline in local population, and loss of local services or retail shops as a consequence
Water quality and quantity	Establishment of plantations can reduce soil erosion and improve water quality in catchments	Plantations may increase soil erosion during establishment and harvesting, and use of chemicals may result in water quality problems. Plantations may have high water use and reduce availability of water in local streams or aquifers
Biodiversity	Establishment of plantations can reduce logging pressure in native forests, and deforestation, and therefore support biodiversity. Plantations can also act as buffers for natural forest areas. Some types of plantations may also support particular flora and fauna that contribute to improved biodiversity outcomes in some regions	Plantations may reduce biodiversity if they replace natural ecosystems such as natural forests. The establishment of single species stands may reduce diversity compared to alternative uses of the same land. There may be increased invasive pests or diseases, or fires. Some concerns have also been expressed about whether some plantation tree species will become invasive weeds in nearby areas

Sources: Carrere and Lohmann (1996), Cossalter and Pye-Smith (2003), Schirmer (2007), McDermott (2012)

many other gaps in knowledge need to be filled; the three case studies we include exemplify the complex nature of achieving sustainability in the plantation sector, and the mix of business drivers, government incentives and community needs that must be considered; however, it must be recognised that there remains a lack of in-depth studies of both the business outcomes and sustainability implications of plantation expansion in many countries and contexts.

These case studies also highlight that debates about sustainability are not as simple as criticism of the practices of businesses: in all three, government incentives were an important driver of the way in which plantations were established, and hence of their sustainability outcomes. Globally, a majority of tree plantations have been established with the assistance of government subsidies or incentives such as government grants, tax incentives, low-interest loans, access to free or low-cost land, and provision of infrastructure or services (Bull *et al.* 2006). These incentives are intended to address perceived market failures and facilitate action that would otherwise happen more slowly, such as achieving national self-sufficiency in timber supply, supporting establishment of large-scale processing plants by guaranteeing them wood supplies, increasing economic opportunities in rural areas, and seeking to expand the environmental services provided by plantations, to name just a few. While designed to achieve positive outcomes, in practice many incentives can and have been abused or misused, or have resulted in unintended negative social, economic or environmental consequences. As a result, the provision of incentives is often associated with concerns about sustainability. The provision of incentives is argued to result in economic unsustainability through distorting market signals and thus encouraging establishment of timber plantations that are not economically viable (for example, establishment of plantations on low-productivity sites, use of inappropriate species, and establishment in locations with little or low access to markets) (Cossalter and Pye-Smith 2003). Incentives are also argued to encourage diversion of land use to plantations without consideration of whether other land uses would have greater economic, social or environmental benefit; and to lead to environmental unsustainability through creating incentives to establish plantations in environmentally sensitive areas, or using practices that are environmentally unsustainable (Bull *et al.* 2006), a criticism that applies particularly in our Indonesian case study.

On the other hand, incentives are often justified on the basis that they can provide opportunities to recognise benefits of plantations that can contribute to improved sustainability (for example, by paying for non-market services provided by plantations). In our third case study 60,000 smallholders in northeast and central Thailand are achieving livelihood benefits and supplying timber to a large plantation industry, while also providing a land use that is argued to reduce environmental problems such as soil erosion (Boulay *et al.* 2012). This was made possible initially through an incentive programme for smallholder plantations.

### **Case study 1: Large-scale conifer plantations in the United Kingdom (UK)**

A desire to ensure self-sufficiency in timber production emerged in the UK after substantial clearance of forests led to shortages of timber during World War I and World War II. This drove development of government policies designed to encourage rapid expansion of tree plantations, including tax incentives for plantation establishment put in place from the 1970s. These incentives encouraged speculative investment in plantations by private investors seeking to reduce their tax burden. This investment created high demand for land, and increased the price of highly productive land. Some afforestation companies responded to lack of affordable land by draining peatland areas which had lower land values, and establishing plantations on the drained land. Following environmental protests in the 1980s, particularly around this practice being used in the Flow Country in northern Scotland, the tax incentives were removed by the government as of 1988. Debate continues about the economic viability of the plantations established on drained peatland, but there is reasonable consensus that at least some of the plantings caused ecological damage, and multiple projects since have sought to restore areas of peatland and associated habitat, with varying levels of success (sources: Anderson 2010; Warren 2000).

### **Case study 2: Small- and large-scale timber plantation programmes in Indonesia**

Indonesia is one of the top ten pulp and paper producing countries globally (Obidzinski and Dermawan 2012). While pulp and paper production historically was dependent on harvesting of natural forest, a large and ambitious tree plantation programme has been established and has operated for more than two decades. Incentives to establish plantations were implemented in response to multiple factors, including declining harvest production from natural forests, and the imperative to provide timber supplies to the multiple large plywood, pulp and sawnwood processing facilities established in the country in recent decades. The plantation programme has two principle parts, not including the long-established teak and pine plantations in Java managed by the parastatal company Perum Perhutani. The first is the *Hutan Tanaman Industri* (HTI) policy, which commenced in 1990 and provided forest concessions to companies together with incentives to establish plantations on the concession land. By 2011, 249 companies had been issued permits covering 10 million ha of degraded natural forest, and around 4.9 million ha of plantations had been established (Wakker 2014). However, the HTI programme also led to clear-cutting of large areas of natural forest

(Barr *et al.* 2010, Pirard and Cossalter 2006), including on land that many argue has substantial ecological value, such as peatland areas in central Sumatra (Thorburn and Kull 2014). The volume of plantation production still falls well short of production capacity, meaning there is substantial incentive to supply processing facilities with illegally harvested logs from natural forest (Wakker 2014). Three major factors explain this outcome: the availability of cheap timber resources through forest conversion to supply mills means businesses profit more from this practice than more sustainable plantation establishment and management; there are many obstacles to the establishment and management of large-scale plantations in areas where claims to tenure or use rights on the land by local populations are the rule more than the exception, creating challenges for business viability (Wulan *et al.* 2004); and the Reforestation Fund which provided many of the incentives for plantation establishment has been erratically (mis)managed (Ernst & Young 1999; Wakker 2014). The programme has been associated with protests about lack of recognition of prior land users and their rights, and concern about social and economic impacts on local communities (Thorburn and Kull 2014). The second main policy aimed at expansion of plantations is the *Hutan Tanaman Rakyat* (HTR) programme, in which smallholder plantations are encouraged through the incentive of allocating smallholders rights to state forest land areas and providing seedlings and loans at subsidised interest rates. The HTR programme aimed to achieve planting of 5.4 million ha by 2016; by 2014, only 193,054 ha had permits issued for planting, and only 9,577 ha had been planted (data of Ministry of Forestry, September 2014), suggesting a substantial lack of business model viability, although few sustainability concerns have emerged. These disappointing results were explained by several implementation challenges (Obidzinski and Dermawan 2010): a slow and difficult process of identification of eligible land, high transportation costs because land made available was scattered, trade restrictions preventing transferring or inheriting permits, relative lack of economic attractiveness of allowed species compared with other commodities such as oil palm, and slow and complicated administrative processes.

### **Case study 3: Smallholder plantations in Thailand**

In Thailand, large-scale plantation development in the 1980s was often associated with social conflict and protest, with local people protesting eviction of residents from areas established as plantations. These protests led, in 1989, to considerable tightening of how and what area of land could be provided as concessions to large plantation companies (Barney 2004). In its place emerged widespread smallholder plantation development, with the

government providing incentives in the form of free seedlings, fertiliser and 'soft' loans to encourage landholders to establish small plantation areas, and outgrower contracts with any of multiple processing companies becoming common (Barney 2004). While the programme has had varying levels of plantation establishment over time, and most government incentives were removed during the Asian economic crisis of 1997 (Mahannop 2004), smallholder eucalypt plantation growing remains common, with a 2013 paper estimating that 60,000 smallholders were growing eucalypt plantations in Thailand (Boulay *et al.* 2013). Many smallholders choose to grow independently to supply a strong market for pulpwood in Thailand, while others grow under an 'outgrower' contract in which they grow trees and a company guarantees purchase of the product (Boulay *et al.* 2013). Boulay *et al.* (2012) found that smallholder plantations provided diversified income for some but not all of the farmers who grew them, but that some smallholders remained unable to benefit from the income diversification potential as they lacked ability to cope with loss of regular cash income during key growing years of the tree crop. Thus the smallholder programme has been successful, but potentially not equitable in terms of access for all landholders. The smallholder programme has established large areas of plantation – more than 300,000 ha by 2010 according to Boulay *et al.* (2012) – but without the social conflict that was a common feature of the previous highly contentious large-scale plantings driven by granting of large land concessions to companies. Some caution is needed, however: Boulay and Tacconi (2012) note the presence of negative perceptions of impacts of eucalypt plantations on the environment, and argue that the sustainability of the smallholder plantations has not been thoroughly examined.

Like many other aspects of plantation forests, government incentives provided to encourage plantation expansion should not be claimed to be either inherently good or bad for sustainability: their sustainability impacts will depend on how they are designed and implemented. Bull *et al.* (2006) argue that to avoid unintended negative outcomes governments should, amongst other things, create clearer links between instruments used to encourage plantation establishment, and sustainability outcomes. Explicitly considering all dimensions of sustainability and monitoring outcomes against these different dimensions will reduce the potential for unintended negative outcomes, while enabling positive sustainability outcomes. To do this, however, requires understanding the sustainability implications of plantations. The following three sections examine this in detail for three areas in which sustainability concerns commonly emerge: land ownership and tenure; deforestation and biodiversity; and employment and communities. We follow this with a discussion of how to enable positive outcomes in these core areas through designing plantations well, considering the issues of scale, and considering enabling conditions through the supply chain.

## Land ownership and tenure

One of the largest business costs faced by plantation developers is the financial cost of accessing land on which to establish plantations. The drive to reduce costs of land can and has led to substantial tension between business and sustainability outcomes. Governments have often sought to encourage plantation expansion by offering cheap or free land to plantation companies. In many cases, this has been done with little consideration of the existing social, economic and environmental value of that land, leading to land being made available through the eviction of prior residents, through refusal to recognise claims of land ownership or tenure by indigenous groups or subsistence farmers (Chomitz 2007; Tauli-Corpuz and Tamang 2007), or through clearing natural forest or vegetation with important environmental values (discussed further in the next pages).

The widespread establishment of plantations on land without recognition of the rights of previous occupants or users of that land is one of the most commonly reported issues in conflicts over plantation establishment, including in two of our case study countries. A review by Gerber (2011) identified documented instances in which land users who lacked secure or recognised tenure were displaced from their land in order to make it available for plantation establishment, in countries as diverse as India, Thailand, Indonesia, South Africa, Cameroon and Chile. This occurred both on state-owned land under concession regimes, and in some cases on land sold to private investors.

While 'land grabs' for commercial plantation development are most commonly reported in countries with poorly documented or regulated tenure systems, concern about land tenure and land access rights extends beyond this. Even in countries with robust land tenure systems, concern has been expressed about the indirect effects of plantation expansion on land access for other landholders. For example, in the 1990s many farmers argued that plantation expansion in some rural areas of Australia drove up land prices and reduced their ability to compete with plantation companies to purchase land, thus reducing their ability to maintain a viable farm business (Schirmer and Tonts 2003). Meanwhile, in Ireland through the 1970s to 1980s farmers argued that land being allocated by the government for plantation establishment should have been distributed to farmers as part of longer-term processes of restoring land rights to Irish farmers after independence from Great Britain was achieved in the early 1900s (Schirmer 2007).

While cheap or free land has many business advantages, the first consideration when examining the sustainability of a plantation should be ensuring that the plantation is being established on appropriate land, under conditions of free, prior and informed consent. This requirement is now embedded in many voluntary certification schemes, such as the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC) schemes, although different certification schemes

vary in their interpretations of what constitutes free, prior and informed consent (Mahanty and McDermott 2013). The same certification schemes require consultation with stakeholders potentially affected by a plantation being established in their region. While addressing these issues is challenging, and may at first appear an imposition of costs that in itself reduces business viability of plantation companies, the cost of ensuring appropriate use of land is low compared to the social cost of plantation companies displacing previous land users without fair recognition, negotiation and compensation; and compared to the very high social and economic costs of the land use conflicts that often result when land is appropriated without free, prior and informed consent. Even considered from a purely business-oriented point of view, it is essential that businesses evaluate the true costs of conflicts, which can involve substantial delays in plantation establishment, damage to infrastructure and machinery, and increased management costs, amongst other consequences (Schirmer 2007).

### **Deforestation and biodiversity**

The second common area in which sustainability opportunities and threats are reported for plantations is that of deforestation and biodiversity impacts, as is evident from Table 9.1.

Tree plantations are often promoted as a means of reducing deforestation by reducing pressure to log natural forests (see for example Sedjo 1999; Paquette and Messier 2010). On the other hand, they are argued by critics to contribute to deforestation and ecological degradation, particularly (although not only) when they are established on land cleared of natural forest or other important ecological communities (Carrere and Lohmann 1996; Cossalter and Pye-Smith 2003). This debate is exemplified by our second case study, in which a large-scale plantation programme is intended in part to provide wood supplies that act as an alternative to roundwood from natural forests, but which is argued to have itself contributed to deforestation through encouraging clearance of natural forest on forest concessions provided to companies as part of encouraging plantation establishment.

The idea that tree plantations can reduce deforestation is based on the idea that the timber they produce can substitute for timber from natural forests, and is supported by arguments relating to the relatively higher productivity of plantations in producing timber volume compared to most natural forests; and the availability of cleared or degraded land on which to establish plantations. A necessary condition is that new plantations are not established through clearing natural forests.

Despite the frequent promotion of plantations as having a role in reducing deforestation, few studies have evaluated whether this is in fact the case. Those that have use methods ranging from descriptive statistics to theoretical modelling and econometrics. Work by Dal Secco and Pirard (2014) suggests there is a convergence of results with evidence that the expansion of timber

plantations is associated with reduced degradation of natural forests, but this does depend on the elasticity of demand, which determines whether plantation-grown timber will in fact replace demand for timber from natural forests, or whether there will simply be an overall increase in consumption of timber products. Similarly, the size of markets matters: the more open the economy the higher the risk that plantation supply will not substitute for natural forest production, but will instead add to it and increase supply to external markets (e.g. Pirard and Cossalter 2006). The effectiveness of plantations in substituting for natural forest timber also depends on scale: at the household level, several studies suggest success in replacing fuelwood sources used by households, for example (Dal Secco and Pirard 2014).

Additionally, tree plantation expansion might reduce natural forest degradation but increase deforestation at the same time, because it may contribute to lowering the economic value of natural forests where logging is no longer taking place, and create incentives for conversion of natural forests to other uses, particularly agriculture. This suggests a critical need for policies to accompany plantation expansion that address the potential for perverse outcomes, and for careful evaluation of the potential for such unintended effects. The lack of in-depth and robust evidence for the contention that tree plantations can reduce deforestation also emphasises a need for improved evidence to back the common claims made on this issue, whether the argument is that expansion of tree plantations reduces or enhances degradation of natural forests.

In the case of deforestation there is again a tension between business imperatives and sustainable development related to the cost of plantation management. In many cases, it is cheaper to access land for plantation establishment if that land has high ecological value but low economic value, rather than to access cleared land that has a higher price due to the higher value of its alternative land uses. In case study 1, a key driver for establishment of plantations on ecologically valuable peatland areas in Scotland was the high price of alternative sources of land that would not have led to the same environmental sustainability concerns, due to their viability for agricultural land uses. A common solution proposed to this is to better integrate smaller-scale plantings into existing landscapes, one that we examine in more detail later in the chapter.

## **Employment and communities**

Many of the social and economic sustainability concerns raised about plantations centre on their effects on rural community life. As McDermott (2012) identifies, critics argue that plantations displace previous residents and land uses, reduce employment, and lead to loss of population and reduced economic viability. Proponents argue that plantations provide new employment and income diversification opportunities, and by doing so support rural population levels and hence local communities. As with many other issues

related to sustainability of plantations, there is limited evidence to decide the ongoing debates about the employment and community effects of plantations (McDermott 2012).

Despite being an apparently simple question, identifying the true ‘impact’ of plantations on employment and local communities requires detailed analysis of various factors, including: the amount of employment generated by the plantation compared to previous land uses; the spatial location of the jobs, particularly whether people who work on the plantation live in local communities or some distance away; the wages paid to plantation workers compared to those paid to people for alternative land uses; and the working conditions provided for workers.

Detailed studies in Australia suggest that changing land use from agriculture to plantations can result in either a net gain or a net loss of employment, depending on what type of agricultural land use is replaced and the type of plantation being established; and that changing land use to plantations is associated with complex spatial changes in the location of jobs, which means there are employment benefits for some communities and losses for others (Williams and Schirmer 2012). For example, long-rotation plantations grown for sawnwood production produce higher rates of employment per hectare compared to short-rotation plantations grown for pulpwood production. The same study highlighted that over time, increasing mechanisation of most land uses has reduced the employment they generate, including agricultural land uses as well as plantations (Williams and Schirmer 2012). This suggests that increasing mechanisation in plantations, a change that often improves business efficiency and viability, but is frequently associated with decreasing labour requirements (Bayne and Parker 2012) should not be argued to reduce economic benefits of plantations unless it is occurring in the absence of similar mechanisation of alternative land uses.

As with other areas of sustainability, whether a plantation has positive, neutral or negative outcomes for employment depends on the way that the plantation and the supply chain that surrounds it is designed. For example, Pirard and Mayer (2008) argue that successfully integrating plantations in the landscape can enable positive outcomes by creating opportunities for workers to combine work at the plantation with associated cash wages from other activities, such as taking care of cattle or gardens.

### **Designing sustainable plantations**

The widespread debate about sustainability of plantations highlights the importance of carefully designing plantations. Design here means not just the configuration, location and species planted, but the design of governance systems, markets and supply chains to support sustainable practice in the plantation sector. Design is critical: asking plantation businesses to bear the burden of additional costs to ensure sustainability in the absence of a broader system of governance and markets that requires and rewards sustainable

practice will likely lead to business failure as, in the absence of good governance and market support structures, cheaper unsustainably produced plantation roundwood will outcompete more sustainable product.

Throughout this chapter, we emphasise that plantation forestry cannot be characterised as inherently ‘sustainable’ or ‘unsustainable’. Rather, each situation in which plantations are being established should be evaluated to identify potential sustainability challenges and opportunities. These must then be addressed and enacted throughout the life cycle of plantation forestry business activities, from proposal and planning to harvest and replanting. This can be supported by business systems and processes that ensure such evaluation and action is in-built as part of plantation design, implementation and management. These business systems must go beyond checklists of different concerns or issues that have emerged with previous plantations: a new plantation may present new or unique sustainability considerations, and businesses need to have processes that proactively identify not just the issues that have arisen in the past, but also emerging challenges, thus enabling these to be addressed before they become a sustainability problem. A key challenge in achieving this is a dearth of evidence on which to make good decisions about the sustainability of plantations: much of the debate about sustainability is assertion- rather than evidence-based. Spatially and temporally explicit work on sustainability of plantations in different situations is a critical need, with examples such as the work of Baral *et al.* (2014) providing an exemplar of the type of evidence necessary to inform stakeholders and decision processes.

While a growing literature focuses on when and why sustainability problems may emerge from plantations, particularly industrial plantations, very little work has examined what conditions enable sustainable plantations to be established by businesses (Kröger 2013). There is, however, a broad body of work that suggests four core areas for consideration in the design of sustainable plantations. First, the scale of plantation establishment should be considered. Second, the role of the supply chain must be considered. Third, dialogue and engagement with stakeholders is essential. Fourth, good governance systems – which can encompass and drive many of the first three areas – are essential, whether they be government-driven, or voluntary through certification systems such as the FSC or PEFC. Each of these four areas is considered below.

### ***Enabling sustainability through scale: Is small-scale the answer?***

Worldwide, many of the sustainability concerns expressed about plantations are focused on industrial plantations, specifically those plantations established in large single areas, usually using monocultural stands, owned by large national or multinational corporations, and producing pulpwood or biofuel (Schirmer 2007; Gerber 2011; Kröger 2013):

there is a set of ‘specific grievances’ typically arising against corporate pulpwood plantations: pollution of soil and waters in the investment

area; expansion to traditional communities' lands; rural mechanization and ensuing unemployment; industrial pollution; increased traffic due to logistical operations; outsourcing and the degradation of working conditions; creation of food insecurity by monocultures ... A universally applied investment model, such as the large-scale pulp model, tends to create a set of broadly similar industry-specific grievances across different contexts.

(Kröger 2013: 30)

Gerber (2011) argues that the reason for higher rates of conflict over large-scale industrial plantations is because the scale of impacts of plantations corresponds to their size, with large-scale plantations more likely to be the subject of conflict due to their greater social, economic and environmental impacts.

Given that the types of sustainability concerns documented in Table 9.2 are most commonly raised in relation to large-scale plantations, are small-scale plantations the answer to sustainability concerns? Small-scale plantations – typically a few hectares established by individual landholders who sell the timber to contribute to their household income – are argued by many to avoid some or all of the problems associated with large-scale plantations, such as displacement of residents, lack of provision of local employment and environmental impacts. Work by Schirmer (2007) and Gerber (2011) highlights that, to date, little conflict has emerged over small-scale, diverse tree plantations, even in regions where the total area of these small plantations was relatively large. Small-scale forestry is considered more socially acceptable than large-scale plantations, particularly because it is argued to provide income-earning benefits to the landholders who adopt it, to provide employment opportunities to locals rather than to external 'outsider' corporations, and to address various environmental degradation problems as well as provide benefits such as shade and shelter to livestock. The experiences of countries such as Thailand (described in case study 3) and Vietnam support these broader findings: in these countries, large numbers of smallholder plantations have been established, and despite their aggregate area being relatively large, have attracted less criticism than industrial plantations – although it should be noted they are not criticism-free, with some concerns being raised about equity of access to smallholder trees, with richer households more likely to be able to access them (McElwee 2009; Boulay *et al.* 2012; Sikor 2012).

Despite these encouraging examples, in most countries small-scale plantations, such as agroforestry, farm forestry, and other smallholder tree plots, make up a relatively small proportion of the total tree plantation estate, and many agroforestry programmes achieve lower than hoped for rates of adoption (Glover *et al.* 2013). This failure to achieve desired rates of adoption is explained in many ways in the literature, usually with reference to the many factors that reduce landholder willingness to take on small-scale forestry,

such as concerns about taking on a long-term investment; low financial returns from agroforestry; reductions in land use flexibility associated with growing a long-term crop such as trees; and a view that growing trees on farmland is unacceptable, amongst others (see e.g. Schirmer *et al.* 2000; Pattanayak *et al.* 2003; Mercer 2004). For example, in Australia, Schirmer *et al.* (2008) identified that landholders who were given the option of growing eucalypts for commercial wood production on their land with a guaranteed purchaser of the pulpwood at the end of the rotation, versus selling their land to a plantation company, typically chose the latter option. They did this as selling land had greater economic benefits for them, and enabled them to purchase new land that better fitted their farming priorities, whereas leasing land required them to commit their land long-term to a land use they couldn't change.

This suggests that small-scale plantations often have important business viability challenges that reduce uptake by the landholders who are essential to their widespread adoption, despite their widespread promotion in the literature. It is essential to overcome the problem of creating viable business opportunities in the small-scale sector if small-scale plantations are to become the solution to plantation sustainability issues many argue they could be.

Business imperatives are also argued to drive the focus on establishment of large-scale plantations in preference to small-scale plantations. Large-scale plantations are argued to provide greater economies of scale, reducing the cost per unit of production and improving competitiveness in the global timber market (Schirmer 2007). However, this economic imperative is debated, and in some cases supply chain relationships have been developed that enable the aggregation of small-scale growers to supply large markets (see for example case study 3, and Nawir and Santoso 2005), thus enabling economies of scale without having to establish large single areas of plantation.

### ***Enabling sustainability through the supply chain***

Sustainability considerations about plantations are not limited to the site of the plantation itself. It is also critical to consider sustainability issues in the broader supply chain that plantation forestry forms part of, and how the supply chain can support sustainable practice. This means that plantation companies need to consider not only the sustainability of their own practices, but of their suppliers and of the processing businesses and markets they sell products into. Is the plantation supplying a processing plant about which there are sustainability concerns such as poor working conditions, pollution, corruption or other issues? Is the plantation located in an area with access to a viable market that enables the realisation of the income earning opportunities promised by plantation developers? A plantation is not sustainable unless it is part of a supply chain in which there are appropriate social, economic and environmental outcomes through to the final market destinations of products.

Although supply chain analysis is now widely recognised as critical to ensuring sustainability and corporate social responsibility (see for example Andersen and Skjoett-Larsen 2009), full supply chain analysis of sustainability remains an emerging area in the field of plantation forestry (see for example Zuo *et al.* 2009). Most voluntary certification schemes have some supply chain focus as part of certifying plantations, the extent of which varies depending on the type of certification involved.

Businesses are increasingly recognising that to be viewed as legitimate by the broader public, and hence have a ‘licence’ of social acceptability that enables them to operate without protest or conflict, they must consider the sustainability of the entire supply chain they are part of, rather than just of their own operations (Vidal *et al.* 2010). Perhaps the most active consideration of the broader supply chain can be seen in the activism of environmental non-government organisations (ENGOs), who target the entire supply chain as part of market campaigns to achieve change in what they view as unsustainable practices. This emphasises that unsustainability at one point in the supply chain has far reaching implications, through to consumer markets in which the goods produced through unsustainable practices are sold (Schirmer 2013). Plantation businesses must consider sustainability in their broader supply chain, as protests against unsustainable practices in any part of that chain can have very real effects on their own business viability, as activists target the supply chain in order to achieve change. What may at first seem like a practice in other parts of the supply chain that is disconnected from the day-to-day business priorities of a plantation company in fact presents a substantial threat to their market success, and must be actively addressed by that company as part of ensuring both sustainable practice *and* their own business viability.

### *Enabling sustainability through dialogue*

Sustainable practice requires engagement between stakeholder groups at a number of different levels: both the communities in which plantations are established, and other stakeholders who have an interest in plantation forestry. Kröger (2013), in one of the few studies to examine why conflict had *not* arisen over a large-scale plantation development, identified that a critical factor in the success of the Suzano pulp plantation investment in the Eastern Amazon was the presence of good relationships between the company involved and local communities. This finding echoes that of many other studies that emphasise the importance of having thorough and meaningful public participation processes, both to prevent conflict over plantation practices (see for example Gordon *et al.* 2013; Dare *et al.* 2014), and to resolve these conflicts if they do emerge (Dhialulhaq *et al.* 2014). The Forests Dialogue<sup>1</sup> and the New Generations Plantations Platform<sup>2</sup> are two examples of dialogue processes that connect plantation stakeholders at local, national and international levels.

The need for good processes of public participation – variously labelled consultation, collaboration, community engagement and many other names, each of which can be defined in multiple ways – is well recognised. However, to be successful in ensuring sustainable practice this public participation must be meaningful. ‘Meaningful’ means that there must be an ability to modify or change plantation practices in response to the issues, questions and opportunities identified during public participation processes (Schirmer 2007; Dare *et al.* 2010). Tokenistic consultation processes, in which plantation companies invite people to submit their views but fail to act on or respond to them, are likely to worsen relationships between plantation businesses and the communities and stakeholders with an interest in their activities; and reduce the likelihood that potential threats to sustainable practice will be identified and acted on.

Many methods can be used to ensure appropriate communication and collaboration with communities and stakeholders (see for example Dare *et al.* 2010). These should be tailored to the local cultures and practices in different parts of the globe in which plantations are established. While often dismissed as cost prohibitive, the costs of proactive communication must be weighed against the costs of delays in plantation operations resulting from protest or conflict over plantations (Dare *et al.* 2010). In many cases, the costs of delays or lost production are likely larger than the investment needed to improve communication; the evidence of widespread conflict over plantations worldwide suggests that conflict-related expenses represent one of the more substantial costs faced by plantation companies in many regions (Mola-Yudego and Gritten, 2010).

### ***Enabling sustainability through effective governance***

Sound, effective and fair governance systems are essential to ensuring the sustainability of plantations. For example, ensuring plantations do not displace previous land uses or users requires the presence of just and effective land tenure systems that protect the rights of both the environment and people. Good governance may be driven by government or by voluntary governance systems such as the PEFC or FSC certification schemes already prominent in the forestry sector (or, ideally, involve both). Given that good governance is implemented at multiple scales and in multiple ways, Kanowski (2010) recommends four steps to implementing good governance for the forest sector: (i) establishing the evidence base needed to support good governance, and ensure policy makers have access to this information; (ii) agreeing on the contributions plantations should make – requiring strong processes of stakeholder participation and dialogue to achieve consensus where possible on what is a ‘sustainable’ plantation; (iii) designing governance regimes that address the issues and needs identified in the first two steps; and (iv) ensuring forest practice systems, including monitoring and evaluation systems, are established to support and meet the requirements of the

governance regimes in place. Achieving these four steps requires implementing many of the areas of practice discussed earlier in this chapter, particularly establishing a solid evidence base regarding sustainability issues that are often contested, and developing systems of constructive two-way dialogue.

### **Future directions**

For their business to succeed, plantation forest managers must understand that the markets for the goods they produce depend on their social licence to operate, in other words on whether consumers and stakeholders believe their business is sustainable enough to be acceptable. Achieving social licence in turn depends on the sustainability of plantations, and public perceptions of that sustainability. Plantation businesses are increasingly recognising this.

Perhaps the highest profile example of a public commitment to changing practices in order to achieve social licence to operate is the announcement in 2013 by Asia Pulp and Paper (APP) that they would implement substantial changes to their practices, including ending their clearing of natural forests and guaranteeing free, prior and informed consent. This decision was made after a sustained campaign criticising APP's practices, particularly in Indonesian forests (Dieterich and Auld in press), which substantially reduced their social licence through consequences such as the Forest Stewardship Council disassociating APP and subsidiary companies and terminating certifications held by those companies. This is one of many examples in which plantation companies are committing to changed practices, although there is debate both about the 'genuineness' of the commitments made, and whether highly public pressure campaigns are effective in achieving change to sustainable management in the longer term (Dieterich and Auld in press). Despite these caveats, and in the context of business and sustainability, plantation businesses must recognise that social licence to operate is dependent on public perceptions of the sustainability of their practices, and proactively ensure and communicate sustainable practice.

The large-scale monoculture plantations preferred by many plantation growers for their perceived business advantages, and which have dominated expansion of plantation forestry in recent decades, are also the plantations most associated with sustainability concerns. The small-scale planted forests promoted by many as the solution to the concerns associated with large-scale corporate-owned plantations have in most countries not achieved the hoped-for widespread adoption by landholders, and have also attracted some criticism. Moving forward, a more sophisticated discussion about the benefits and costs of tree planting at different scales is needed, together with design of programmes that combine the best of both, while minimising the potential negative outcomes of both small- and large-scale plantings.

Plantation forests are often argued to provide benefits on the one hand and costs on the other, often for the same issue, such as employment, biodiversity or water quality. On the one hand, they are promoted as having potential to

reduce deforestation through providing an alternative wood supply; on the other, they are criticised as causing deforestation, principally when they are established on land cleared of natural forest for the purpose of establishing the plantation. They are promoted as a potential generator of jobs and income in rural communities, but concerns are also raised about whether plantations generate the same number of jobs as other land uses, and whether the jobs and income generated go to local communities or to outsiders.

How can the sector reconcile the business opportunities presented by plantations with the widespread concerns about sustainability? First, it must take seriously the real concerns about sustainability raised by critics. These are reasonably widely documented, but more systematic documentation of sustainability concerns is needed, together with evaluation of the evidence where there are competing or conflicting claims. Second, better understanding is needed of when and why plantations work *well*. It is dangerous to focus only on identifying problems, as this fails to recognise what conditions enable the establishment of successful plantations both in terms of providing economic return, and in terms of broader social, environmental and economic sustainability. Third, those who promote simple solutions to complex problems – such as the use of small-scale plantations as a panacea for the problems argued to result from industrial plantations – must develop more complex, nuanced and realistic analyses that recognise the barriers that prevent more widespread use of some of these proposed ‘solutions’ to concerns over sustainability of plantations. Mature debate about the consequences of plantations is needed that demands better evidence for claims about both the promises and the perils of plantation forestry if there is to be a shift to truly sustainable practice in the plantation forest sector. Finally, achieving sustainability in the plantation sector depends on what is happening in the rest of the global forest sector. A key challenge is the price signals in the market: where plantation-grown roundwood competes with wood harvested in natural forests that are unsustainably managed, prices often do not reflect the true cost of producing sustainably grown wood. Achieving the price signals needed for both viable plantation businesses and sustainably grown plantation roundwood requires reform not just in the plantation sector, but in the broader global forest sector.

## Notes

- 1 <http://theforestdialogue.org/initiatives/IMPF>.
- 2 <http://newgenerationplantations.org>.

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