New forests and new forest people in central Vietnam: the acacia boom

Christian A. Kull[1]; Van Hai Thi Nguyen[1, 2]; Roland Cochard[1]; Dung Tri Ngo[3]; Thao Phuong Thi Pham[4]; Ross T. Shackleton[1,5]; Canh Quoc Tran[4,6]; Thang Nam Tran[4];

[1] Institute of Geography and Sustainability, University of Lausanne, 1015 Lausanne, Switzerland

[2] Wyss Academy for Nature, University of Bern, Kochergasse 4, 3011 Bern, Switzerland

[3] Consultative & Research Center on Natural Resource Management (CORENARM), 101-C1, Truong An Apartment Building, Hue City, Vietnam

[4] Faculty of Forestry, University of Agriculture and Forestry (HUAF), Hue University, 102 Phung Hung, Hue City, Vietnam

[5] Swiss Federal Institute for Forest Snow and Landscape Research (WSL), Zürcherstrasse 111, 8903 Birmensdorf Switzerland

[6] Thua Thien Hue Forest Protection and Development Fund (HUE FPDF), 2nd Floor - Building No. 2, 119 Van Xuan, Hue City, Vietnam

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Introduction

Since the 1990s, Australasian *Acacia* species (*keo* in Vietnamese; hereafter "wattles") have become the dominant landscape feature in many parts of Vietnam, reshaping people's livelihoods and identities. The country is covered by the largest area of cultivated wattles in the world (Griffin *et al.*, this volume). Wattles have facilitated a wholesale redefinition of forest landscapes and of the people who live from them (Kull *et al.*, 2017). The role of this chapter, within a book focused on wattles, is to ask what these wattles have done to and for Vietnam, using the example of Thừa Thiên Huế province. The story in Vietnam is different to what wattles have done to other regions globally. In some countries wattles have been labelled invasive species, impacting native ecosystems and water resources (Le Maitre *et al.*, 2011; Le Maitre *et al.*, this volume); in others they have contributed to new aesthetics of landscapes; in yet other places foresters and humanitarians hope they will do more to feed people and protect the soils (Kull *et al.* 2011; Richardson *et al.*, this volume). In Vietnam, the story is different and pulls one's attention to ambitious projects of nation-building combining ecological mending, economic development, and social engineering, and to the creation of 'new forests' (substantially different from natural forests) and associated 'new forest people' (with changed livelihoods and identities) at a significant scale.

According to the government (MARD, 2020) wattle plantations represent 65 to 85% of the nation's 4.4 million ha of plantations, (the rest being mostly rubber, eucalyptus, or pines), or about 6 to 9% of the national land area (Table 1). These plantations are particularly

concentrated in the north-east, north-central, and south-central regions, and (to a lesser extent) the central highlands (Byron, 2014). Despite wattle's widespread cultivation and naturalization in Vietnam, unlike elsewhere in the world (Marchante E. *et al.*; Pauchard *et al.*; Richardson *et al.* this volume), its invasiveness is rarely noted (Richardson *et al.*, 2015). Wattles are grown in large-scale industrial plantations and on many small household-owned woodlots, as well as around homesteads and along canals and roadsides. Wattle stands consist of *A. auriculiformis, A. mangium*, and – most prominently – selected clones of the interspecific hybrid between the two species. Harvested wattle wood supports a burgeoning wood product industry, focused on pulpwood (mainly for paper production) and furniture, with an export value of 14.3 billion USD in 2021 (S. Midgley, personal communication, February 2022; c.f. Griffin *et al.* this volume). Smallholder households own a large (and increasing) proportion of wattle plantations – now between 50 and 70%, depending on the source (Byron, 2014; Nguyen and Kull, 2022). For these wattle growers, the plantations provide significant incomes and livelihood security (Thulstrup, 2014; Midgley *et al.*, 2017; Cochard *et al.*, 2021; McElwee and Tran, 2021; Nambiar, 2021; Arnold *et al.*, 2022).

Acacia species were introduced to southern Vietnam in the 1960s for forestry trials and plantations (Midgley *et al.*, 1996). *Acacia auriculiformis* was the most widely planted species. It also became popular in the north after reunification in 1975 (Nguyen and Le, 1993) and was integrated into some smallholder farms and agroforestry systems, like near Khe Sanh (Midgley *et al.*, 1996). In the post-war period, efforts to identify, select, and promote tropical *Acacia* species as fast-growing, high-potential forestry and reforestation trees intensified. Indonesia and Malaysia were initially faster to develop large-scale wattle plantations. Vietnam built on those efforts through private forest industry companies and national agencies (Awang and Taylor, 1993; Midgley *et al.*, 1997; van Bueren, 2004). Notably, around 1980 the Vietnamese Forest Science Institute (now the Vietnamese Academy of Forest Sciences) engaged in a long-term collaboration with Australian government research and development institutions (Turnbull, 1991; Griffin *et al.*, 2011). Work in Vietnam focused on identifying and testing the wood qualities, productivity, and environmental requirements of diverse provenances, particularly focusing on *A. mangium* and *A. auriculiformis.* Spontaneous hybridisation of these species was observed in the late 1970s in Sabah, Malaysia, and in 1991 in Ba Vi, west of Hanoi, and led to intensive research and testing that identified productive hybrid clones and developed nursery systems for their mass propagation (van Bueren, 2004; Sein and Mitlöhner, 2011).

As the 1990s progressed, a combination of factors facilitated the rapid growth and uptake of wattle plantations in Vietnam (Amat *et al.*, 2010; Sikor *et al.*, 2011; McElwee, 2016; Cochard *et al.*, 2017; Nguyen, 2021). The government undertook land reforms as part of its economic opening, reversing collectivisation, and allocated cropland and later forestland to households. With increasing awareness of natural forest degradation in the country, numerous national programs and foreign-sponsored projects aimed to stop deforestation, rehabilitate degraded lands, regreen "barren" hills, and eradicate poverty within rural hinterlands. Wattles soon replaced struggling initial plantations of eucalypts and native pines, which were often affected by plant diseases and which met with local resistance due to issues of water scarcity

(McElwee, 2016). At the same time, the government invested strongly in developing a forest products industry which was seen as a potential important export earner, with increasing domestic and international market demand for woodchips, pulpwood, and saw timber. National programs and strategies over the past thirty years laid out the government's goals for natural and planted forests, promoting tree planting, poverty reduction, and the development of the industry as well as protection of biodiversity. The latest strategy, the *Forest Development Strategy 2021-2030* (Decision 523 /QĐ-TTg, MARD, 2020) sets economic, social, and environmental goals for an "effective, efficient, highly competitive economic-technical sector". A marked difference with neighbouring countries is the high proportion of smallholder participation, as opposed to large-scale forest companies.

In this chapter, we describe what this wattle boom has done to and for the landscape and people of Vietnam by using the example of Thừa Thiên Huế province. We first describe how substantial areas of 'new forest' were created, sometimes at the cost of natural forests. While these short-rotation wattle woodlots may superficially look like forest and are often counted together with natural forests in forest cover statistics (for example, a key environmental objective of the above-mentioned *Forest Development Strategy* is to reach and maintain 42% forest cover), they do not have the same functions as more natural mixed forests. They provide significant economic commodity products, they alter hydrological and soil functions, but they barely provide any non-timber forest products (NTFPs) or natural habitat. We then show how these 'new forests' also involve the emergence of 'new forest people'. By this we refer to new livelihoods and identities. The plantations broadly increase income, both directly through sale of wood products and indirectly through associated employment, though more so for some groups of people as compared to others. In upland areas, ethnic minority villagers are building new subjectivities around the wattle economy and around their contracts with state forest agencies, seeing themselves increasingly as forest growers and protectors. We finish by raising some questions regarding the social changes and environmental sustainability issues link to this wattle boom.

Case study and methods

We reviewed the development of wattle forestry and its impacts on people and landscapes (Fig. 1) in Thừa Thiên Huế (5033 km^2), one of Vietnam's 63 provinces, a microcosm the country. The province consists of the city of Huế and its hinterlands. In the roughly 50 km that separate the coast from the Laos border, the landscape changes from coastal lagoons and plains (largely used for aquaculture and rice cultivation) to gentle hilly midlands (now covered in planted wattle) and then to a mountainous zone of deep river valleys and forested upland ridges reaching 1500 m above sea level. The province was a key theatre in the 1955-1975 war between the communist north and American-backed south. Huế City, which was the 19th century imperial capital of Vietnam, is now an important economic, industrial, and educational growth pole, home to half of the province's 1.15 million inhabitants. Roughly one-twentieth of the population comes from ethnic minority groups, who reside predominantly within the upland districts.

The results reported here build on and synthesize different studies undertaken between 2017 and 2022 under the umbrella of the interdisciplinary 'FT Viet' project funded by the Swiss Programme for Research on Global Issues for Development (see www.ftviet.info). The first study assessed the livelihoods, history, preferences, perceptions of risk, and aspirations of wattle farmers (Cochard *et al.*, 2021; Vu *et al.*, 2022). It involved a survey of 180 farmers in nine communes along a lowland–upland transect. Half of the farmers were selected from those producing sawlogs under criteria imposed by the Forest Stewardship Council (FSC); most of these also produce woodchips and/or non-certified timber. The other half of farmers surveyed were not FSC members and were primarily engaged in wattle woodchip production. The second study focused on two ethnic minority upland communes in A Lưới district through largely qualitative methods like direct and participatory observation, 12 focus group discussions, 100 key informant interviews, as well as 204 household surveys (Nguyen, 2021; Nguyen and Kull, 2022). The third study focused on factors influencing land use changes in upland Nam Đông district, across one commune which was home mainly to ethnic minority people and one commune dominated by Kinh people (T.T.P. Pham , unpublished data). This study included 27 interviews and surveys of 222 randomly selected households. The FT Viet project also relied on diverse remote sensing methods to map forest changes historically (Cochard *et al.*, 2023; Pham *et al.*, 2022) and model future trajectories (Tran *et al.*, 2023). The project also included forest ecology and hydrological surveys, as yet unpublished. For details of methods please refer to each component study.

New forests

At a national level, areas planted with *Acacia* species have increased dramatically over the past 35 years (Table1). This is also reflected within Thừa Thiên Huế province. Here, smallholder plantings started in lowland areas like Phú Lộc and Hương Trà after 1990, initiated by major programs of the government and international donors (notably the 20 million USD Program PAM 4304, 1992-2000, funded by the World Food Programme, and the 213 million USD Program 327 "Greening the Barren Hills", 1993-1998, with funding from Vietnam and the World Bank, which was followed by the 2 billion USD Program 661 "Five Million Hectare Reforestation", 1998-2010) and continuing into the 2000s as people expanded plantations by their own initiative (Cochard *et al.*, 2021, 2023). This contrasts with a later uptake in upland districts like A Lưới or Nam Đông, where serious wattle planting started in 2004, with peaks corresponding to government programs in 2005-2008 and self-motivated plantings from 2010 (Mai, 2017; Cochard *et al.*, 2021, 2023; T.T.P. Pham , unpublished data). Government programs helped by providing seedlings, subsidies, loans, training, as well as market outlets (Cochard *et al.*, 2021).

Wattle woodlots now form a near continuous patchwork quilt of different aged tree stands across the lowland and midland districts as well as into the main upland valleys. The total plantation area as shown by official data (GSO, 2022) is around 13% of provincial land area, with closed wattle tree cover (standing trees) amounting to around 11% in 2019 (Cochard *et al.*, 2023). This is in comparison with about 44% natural forest (ranging from relatively intact to highly degraded) and 9% irrigated rice fields. The average plot size for wattle plantations

is 2.1 ha (SD ±1.5) (Cochard *et al.*, 2021). In lowland areas, nine out of ten woodlots comprise of wattle hybrids, whereas in the uplands, hybrids account for roughly one third while *A. mangium* dominates. Cultivating with hybrids costs more for purchasing seedlings from nurseries (made from clonal vegetal cuttings), while *A. mangium* can be reproduced from seed and is often used in pioneer phases of planting. Plots destined for woodchips are rotated every 4-5 years, while sawlog plots have a rotation cycle approaching 7 years on average (Cochard *et al.*, 2021).

Tree plantations – services and disservices

Different land uses provide different suites of ecosystem services (for example, providing food, fibre, and energy; facilitating carbon sequestration, pollination, or pest control; or contributing to cultural aspects of wellbeing) and gains in one specific land use may mean losses in another. Plantations of wattles have replaced different land covers, including marginal cropfields, bushland, and natural forest. By 'bushland' we refer to diverse forms of land cover – some of it previously natural forest – shaped by grazing, war, fire, swidden, previous logging, and early-succession regeneration. Each land conversion may have benefits or opportunity costs or both. A mosaic of land covers has given way to a more simplified yet economically-productive wattle landscape. Previous resources like food from crops and animals, fuelwood, and rainforest timber as well as NTFPs and fodder grass are essentially replaced by wattle wood cash incomes (Mai, 2017; Cochard *et al.*, 2021). This may make many households better off but others potentially less resilient to shocks or threats due to losses of different capitals (Shackleton and Shackleton, 2004).

In Thừa Thiên Huế province, three quarters of land area converted to wattle plantations was previously bushland. Agricultural land (mostly marginal) was the source of 20% of wattle plots in lowland communes, whereas natural forest (mostly secondary 'swidden forest') was the direct source of 24% of wattle plots in upland communes (Cochard *et al.*, 2021; the conversion of natural forest areas to wattle is confirmed by Pham *et al.*, 2022; Nguyen and Kull, 2022; and T.T.P. Pham, unpublished data). Land conversions, both legal and illegal, are caused by a race to claim land, linked to the lucrative wattle boom as well as to a perception that otherwise customary land resources belonging to ethnic minorities will be locked up in state forests for watershed protection or conservation (Nguyen and Kull, 2022). Modelling of deforestation risk based on the past 20 years suggests that the probability of future conversion of natural forestland to plantations is associated with ease of access (i.e., being close to towns or roads), with private tenure, and with certain policy regimes: there is a higher probability for deforestation on lands designated as 'production forests' and not included in payment for environmental services schemes (Tran *et al.*, 2023; cf. Cochard *et al.*, 2020).

Wattle plantations sometimes replace natural forest, and are sometimes counted together with natural forest in statistics of forest cover and in forest policy arenas (Dang, 2022). With appropriate soil and weed management techniques, wattle plantations can host a variety of understory plants like grasses, forbs, and shrubs (Huong *et al.*, 2020). Furthermore, some effort has gone into using *Acacia* species as nurse trees to re-establish native species, but

these efforts remain rare, limited in reach, and are mainly focused on a small number of economically valuable hardwoods, such as *Hopea odorata* Roxb. from southern Vietnam (McNamara *et al.*, 2006; Dong, 2014; Cochard *et al.*, 2021). Overall, it is nonetheless clear that the vast majority of wattle plantations hardly have the same functions as any natural forests, and are also not expected to have the same functions. These single-aged monocultures of short-rotation crops provide several economic services, but with various trade-offs. Compared with natural forests, known for their high species diversity and endemism (with many species still new to science) (Sterling *et al.*, 2006), wattle plantations host vanishingly little native flora or fauna and have very little direct value for biodiversity conservation (R. Cochard, unpublished data). In contrast, even degraded fragments of natural forest – shaped by past logging, human use, and enrichment – can harbour high plant biodiversity, including endangered species (Van and Cochard, 2017; Cochard *et al.*, 2018).

As noted above, the majority of wattle woodlots are established in former 'bushland' areas. The economic benefits are clear. Yet, there may be opportunity costs: for instance, the privatization of former common land for setting up plantations leads to exclusion of resource uses like shifting cultivation, NTFP collection, or wildlife hunting that may previously have benefitted different parts of a community, in particular more marginalised groups, including women (McElwee, 2016; Vu *et al.*, 2022). It is often presumed by policy makers and stated by farmers that reforestation using wattles helps protect former degraded bushlands from soil erosion and shelters downstream areas from flooding, as well as increasing soil fertility and mitigating drought (Vu *et al.*, 2023). Studies have indeed shown that the establishment of wattle plantations in previously heavily degraded sites can improve soil structure, carbon content, fertility, and microbial activity (Dong *et al.*, 2014; Hung *et al.*, 2016; Harwood *et al.*, 2017; Koutika and Richardson, 2019). However, not all sites were previously heavily degraded, and the benefits (or risks) of wattle plantations with regard to soil erosion and flood mitigation are still rather uncertain (Cochard *et al.*, 2021). Indeed, some impacts may be negative, due to rapid tree rotations, soil disturbance from harvesting and burning, exposed soils after harvest, and poor-quality bulldozing of access tracks. Soil degradation tends to be compounded by the sloped terrain often used for wattle cultivation, in interaction with the strong monsoon and cyclonic rainfalls common from September to December (Malmer, 1996; Sidle *et al.* 2006; Nambiar *et al.*, 2015; Mendham and White, 2019; Van Bich, 2019; Dung and Kim, 2021; cf. Fig. 1). A lot could be improved through sensible site management, for instance via adherence to Vietnam's Sustainable Forestry Management Standard (c.f. Amat *et. al.*, 2010; Mendham and White, 2019; VFCS, 2019; Huong *et al.*, 2020), but these management practices favour large-scale actors and can miss complex social and land tenure factors affecting smallholders.

New livelihoods

In just a few decades, wattles have deeply influenced rural livelihoods in Thừa Thiên Huế province. Outside the principal coastal rice growing areas, wattle plantations now dominate as a primary land use. Mai (2017) found that 81.8% of households plant wattles in three upland, ethnic minority communes, while Pietrzak (2010) reported 97% in the lowlands.

Most rural households grow wattles; the area varies by region and types of growers, reflecting access to land, resources, and length of involvement. Lowland areas have longer growing histories and more certified producers. In the upland districts, depending on the survey and location, households' wattle plantation areas averaged 1.5 to 2.3 ha (T.T.P. Pham , unpublished data), 2.4 ha (Tham *et al.*, 2020), or 1.6 (± 1.0) ha for woodchip producers ('smallholders') and 4.3 (± 3.1) ha for sawlog producers (mostly FSC-certified) (Cochard *et al.*, 2021). In lowland districts, averages were in the range of 3.4 ha (Tham *et al.*, 2020), or 1.8 (± 1.6) ha for woodchip producers ('smallholders') and 8.9 (± 8.6) ha for sawlog producers (mostly FSC-certified) (Cochard *et al.*, 2021).

Wood products from *Acacia* species contribute an increasing portion of household income. A decade ago, wattle-associated incomes in ethnic minority upland communes were just beginning, and accounted for only 7% of annual income per household (with rubber accounting for 43%) (Mai, 2017). Pietrzak (2010) reported similar figures for an upland commune, but in a lowland commune documented an average of 60% of household income coming from wattle plantations. More recently, Tham *et al.* (2020) found that the production and commercialization of hybrid wattles contributed to 33% of household income in upland Nam Đông district and 56% of income in lowland Phú Lộc district. These portions of household income amounted on average to 1,451 and 2,947 USD/yr, respectively. Increases in wattle income tend to be accompanied by decreases in other incomes, like rice cultivation, animal husbandry, or wage labour (Vu *et al.*, 2023). Lowland people who adopted wattle growing earliest are often those with larger land holdings and who are now inscribed in FSC certification programs, having tended to specialize more and more in wood production (Vu *et al.*, 2023).

Indirect income from wattle is also significant. This is largely linked to labour wages and services for planting, weeding, and harvesting of woodlots. There is also money to be made as middlemen and as transporters, or in maintaining tree nurseries, in selling seedlings, as in other types of extension work. In addition, significant employment opportunities exist further up the product value chain in the wood industry. Household surveys in two communes in A Lưới district found that while direct income from wattle was 31-45% of household income, indirect income contributed an additional 25-35% of total annual household income (V.H.T. Nguyen, unpublished data). In her surveys in Nam Đông district, T.T.P. Pham (unpublished data) documented a total of 30.6% of total income from direct and indirect wattle sources.

While the first people to plant wattles often cite participation in a tree-planting program as their motivation to establish wattle plantations, peoples' motivations to continue to plant wattle were linked to income, profitability, and ease of management and selling (Cochard *et al.*, 2021). The uptake of wattle forestry is highly influenced by the availability of investment capital (and labour) and prospects for economic returns. The income is seen as good and stable: even with rudimentary silvicultural practices, upland villagers can expect to earn 300 to 550 USD/ha/yr averaged out over a 3-5 years cycle (Mai, 2017). According to interviewees, such income means that most households can now afford assets such as

televisions and motorbikes (Mai, 2017; Vu *et al.*, 2023). In lowland areas like Phú Lộc, with a longer history of wattle cultivation, closer to processing facilities, and with more capital to invest, incomes from wattle can be higher – on the order of 651 to 978 USD/ha/year in Phú Lộc (Tham *et al.*, 2020). Wattle-derived incomes (and flexible labour requirements) play a role in facilitating other forms of getting ahead, such as labour migration to cities or overseas. In turn, remittances from migrants provide significant financial sources to remaining family members to maintain and even expand their family wattle farms (V. Nguyen, interviews, 2022). As such, in Thừa Thiên Huế most wattle farmers envision staying with wattle farming in the longer term, even expanding their plantations if land can be found (Vu *et al.*, 2023).

At the socio-economic level, observers are clear that wattles have been important in reducing overall poverty both in the uplands and lowlands of Thừa Thiên Huế, however this is associated with few social benefits and increasing social differentiation (Mai, 2017; Tham *et al.*, 2020; Cochard *et al.*, 2021; Vu *et al.*, 2023). For instance, after tracing land ownership and wealth from 2005 to 2020, T.T.P. Pham *et al.* (unpublished data) shows that while wattle increased incomes on average, such increases tended to be higher for people with initial wealth or land, for people of Kinh ethnicity. Low-income households, such as young married couples, have often failed to gain access to sufficient land. Similar trends are found across Vietnam (Sikor *et al.*, 2011; Thulstrup *et al.*, 2013; Thulstrup, 2014; McElwee, 2016, McElwee and Tran, 2021, Sikor and Nguyen, 2007). It is of course possible that similar trends of differentiation would have occurred in the absence of the wattle boom.

Particularly in the lowlands, a social class has emerged of specialized wattle farming business households with larger plantations. These were mostly early adopters of wattle plantations (all Kinh ethnicity, often with previous experience in tree crops like eucalypts or rubber), with higher education levels, strong community leadership positions and/or connections to state forest organizations and other political actors, including associated access to training programs and other offers. Accordingly, these people are over-represented among those obtaining FSC certification and in focusing on longer-rotation, higher-value sawlog production (as opposed to wood chips), allowing them to build capital at higher rates. Their situation contrasts with later adopters, often upland minority households with less wattle land and more dependencies on cassava intercropping and/or wage labour (Cochard *et al.*, 2021; Vu *et al.*, 2023).

These findings from Thừa Thiên Huế support observations from across the country (Midgley *et al.*, 1996, 2017; Thulstrup *et al.*, 2013; Thulstrup, 2014; Nambiar *et al.*, 2015; Kawazaruka, 2020; McElwee and Tran, 2021; Nambiar, 2021). As summarized by Arnold *et al.* (2022), wattle plantations are attractive livelihood options for smallholders for a number of reasons: they produce commercially saleable wood products; there are diverse markets for different end-uses; the trees grow well on poor soils; they do not require elaborate cultivation technologies; they grow fast and thus allow for short rotations; their maintenance and harvest timing is flexible, allowing for flexible labour; accordingly, they provide strong and sufficiently quick returns on investment.

New identities

The creation of wattle-based tree farms and livelihoods is concomitant with various socio-cultural transformations in rural areas. Especially ethnic minority people in the uplands of Thừa Thiên Huế had historically strong socio-cultural connections with the species-rich, densely forested landscapes surrounding them. These 'forest people' (as they were often called by outsiders) had (and still have) a strong sense of place, with surrounding forest landscapes animated by spirits (Århem, 2014). There are indications that the arrival and growth of wattle, and the hands-on involvement of people in this process, has led them to develop new aspirations in relation to the landscapes in which they live, and indeed even to see themselves differently, to take on new identities and subjectivities (Robbins, 2007). Hence we might as a shorthand see them as 'new forest people'. This affects not only upland ethnic minority people, but also majority Kinh people in the uplands and lowlands, within which a class of successful and entrepreneurial wattle farmers has emerged (Tham *et al.*, 2020; Cochard *et al.*, 2021). In this section, however, we mainly focus on the former group.

In Thừa Thiên Huế province, upland ethnic minorities belong to various Katuic groups, including Katu, Taoi, Pako-Pahy and Bru-Van Kieu (Mai, 2017). While they make up only roughly 5% of the provincial population, minority groups constitute nearly 80% and 45%, respectively, of the population of the large upland districts of A Lưới and Nam Đông. Uplanders were long perceived by the dominant wet rice cultivating Kinh population as backward (Rambo *et al.*, 1995), and since independence in 1954, the Vietnamese state has sought to bring these groups into the national fold and modernize them. Policies initiated along these lines included sedentarization, forest land allocation, and diverse agricultural and environmental programs, like reforestation and forestry development. As McElwee (2016) has argued, programs with goals related to natural resource and environmental management also serve to govern uplanders, moulding their lives and livelihoods in ways that reduce their dependence on the natural forest and enrol them in the modern state and its economy.

The historical livelihoods of these ethnic minorities depended on natural forest products and forestland. Besides some animal husbandry, they primarily practiced shifting cultivation (swidden), growing crops for 3-5 years before letting the forest regenerate. They also used forestlands for hunting and gathering of NTFPs such as rattan, honey, fruits, plant medicines, palm-leaf, and other products. Villagers generally had relatively equal access to forest resources, managing them as common property except for swidden plots, which were distributed by village patriarchs. Forests also played a crucial role in people's cultural lives. These include rituals, rule systems, festivals, folktales, songs, and poetry, with certain forests protected as dwelling places of forest spirits. Essential components of identity were linked to peoples' forest lives (Århem, 2009; Bayrak *et al.*, 2013; Nguyen, 2021).

Obviously, these historical livelihoods were never immune to change. For instance, villagers in upland Thừa Thiên Huế learned wet-rice paddy cultivation from soldiers who stayed in their villages during the war, and many were brutally displaced from their homes due to the war and subsequent (re-)settlement programs (Mai, 2017; Cochard *et al.*, 2023). Yet, despite

pushes towards market-oriented, fixed-plot agriculture, many uplanders continued – at least in part – to practice swidden agriculture and forest product collection. Rubber, cassava, and other cash crops took hold in different places and periods, but recent national economic growth in general as well as specifically due to wattle has been much more transformative. Muddy tracks to villages have become concrete roads. Village houses, previously built of wood and palm leaves, are made from concrete. Many households have electric fans, rice cookers, fridges, televisions, and smartphones. Together with new forms of employment in now state-controlled forest territories, wattles have reshaped what it means to be 'forest people' in today's Vietnam (Bayrak *et al.*, 2013; Nguyen, 2021).

Pushed by state policies, constrained by land limits, encouraged by the ease of cultivation, and attracted by profit margins, villagers' livelihoods have transitioned from subsistence-oriented swidden cultivation to livelihoods based on market-oriented tree plantations as well as forest protection contracts with state agencies (Nguyen, 2021). Current livelihood sources in mountain communes (Table 2) may maintain some reliance on NTFPs (Mai, 2017), paddy, and livestock, but they no longer contain swidden crops. Income related to wattle trees (both direct and indirect), and to a lesser extent rubber, and contractual forest protection work of different types now dominate livelihoods. While some swidden-inspired practices remain (like burning for wattle woodlot preparation, or the intercropping of food crops during the first year of a plantation), this major transformation in livelihoods results in a changing relationship with land. People now talk of their land as *trại* (farms) or *rừng trồng* (plantation forest) instead of *rẫy* (swidden land), and these lands are increasingly privatized, and have rigid boundaries.

In her study in two communes in A Lưới, Nguyen (2021) found that 49.5% of households classified by the government as poor continued to gather NTFPs in times of need, yet they faced increasing restrictions in doing so. Resettled villages were further from forest areas, state forest institutions increasingly restricted access to the forestlands they control, and 79% of people perceived that natural forest quality had degraded due to illegal logging and expanding wattle plantations.

These transformations manifest in people's ideas about their identity, as shown through key informant interviews (Box 1). A phrase repeated multiple times during interviews was "we pick up and save every single Dong to invest in growing wattles". Villagers interviewed focused strongly on investment and profit. Nearly 95% of the surveyed households highlighted "they want to expand their wattle farms" to attain their dreams for the future - a bigger house and to ensure that their "children have a better education and get a monthly salary job" (Nguyen, 2021, p243; see also McElwee and Tran, 2021; Nambiar, 2021; Arnold *et al.*, 2022).

These dreams are not without struggles, trade-offs, or contradictions. Wattle farmers may neglect other forest-based livelihood activities, such as workdays to manage community forests, or contracts to patrol state forests, as these jobs are less well paid, more dangerous, and more likely to result in conflicts with neighbours or kin. Additionally, the wattle boom

prompts significant amounts of encroachment and land grabbing by villagers both on state land and between each other (Nguyen, 2021; Nguyen and Kull, 2002).

It could be said that, at least in Thừa Thiên Huế, the diverse government programs to allocate forestland and to jump-start reforestation have – in some ways – succeeded beyond expectations. Upland minority villagers have been enrolled in a wide-ranging redefinition of their lives and relationship to land. This challenges traditional cultural institutions (Bayrak *et al.*, 2013; Århem, 2014) and creates new identities, as we showed above. Their new lives, at least superficially, match images propagated in government policies, publications, and the media of permanent crop fields and new jobs, all to reduce poverty while protecting forest (Nguyen, 2021). This contrasts with other parts of Vietnam, where there has been manifest resistance toward anti-swidden rules and economic transformations (Sikor *et al.*, 2011; McElwee, 2016; To *et al.*, 2017; Pham, *et al.*, 2018).

Many questions remain about the longer-term cultural impact of the wattle-facilitated transformation in central Vietnam. What have people's changing livelihoods done to their cultural identity as minority ethnic people? Some practices and traditions have certainly been lost, but has reduced poverty permitted a certain reaffirmation of others, like festivals? These questions remains open.

Conclusion

This chapter has traced the changes associated with the propagation of *Acacia* species plantations in central Vietnam: creating tree farms and facilitating new lives and identities built around a maturing woodchip and timber industry. The rapid transformations in landscapes and livelihoods that we documented raise many questions related to social change and environmental sustainability as social-ecological systems like Thua Thien Hue's landscapes undergo rapid regime shifts (*sensu* Kull *et al.*, 2017). The short-rotation plantations are lifting incomes for many people and contributing to regional and national economic development, and they hopefully alleviate some logging pressure in natural forests. Yet these wattle woodlots sometimes expand at the expense of natural forest, and are best seen as plantations rather than as forests for they cannot substitute for lost natural forests and their important role for biodiversity, soil conservation, and water supply.

Like any boom crop, wattle plantations are exposed to risks. First, there are risks related to market swings, whether due to fluctuating demand or changing policies (Nery *et al.*, 2019; Barbier, 2020). In 2022, for instance, furniture exports to western markets decreased due to global recession, yet demand for wood pellets spiked due to the Russian invasion of Ukraine and fuelled a major increase in woodchip exports (Phuc To, personal communication, Oct., 2022). Second, there are sizeable risks due to pathogens and diseases. *Acacia mangium* plantations have suffered significantly in southeast Asia from wilt and canker disease caused by *Ceratocystis*, inspiring switches to hybrid wattle or other species (Nambiar *et al.*, 2018; Nasution *et al.*, 2019; Arnold *et al.*, 2022; Hurley *et al.*, this volume). Third, there are environmental risks like storms and soil degradation from badly sited and managed

plantations, and this could be exacerbated by increasingly frequent and extreme events associated with climate change (Sidle *et al.*, 2006; Yamashita *et al.*, 2008; Locatelli and Nicoll, 2017; D'Amato *et al.*, 2017; Pham *et al.,* 2018; Dung and Kim, 2021). Finally, while government efforts have sought to involve all households and although livelihoods have improved for many, the gains are uneven, and losses (whether in cultural traditions, livelihood diversity, or local ecological knowledge) are potentially unsettling in various ways. The broadscale rush to wattle may bring short-term economic benefits; yet putting all eggs in one basket may also be a risk to resilience.

In the face of these trends and risks, the government is trying to encourage longer-rotation sawlog production, and there are different efforts to create more sustainable supply chains. Forestry standards are being promoted alongside technical supports to improve plantation management for soil, water, and biodiversity, including longer rotations, slope limits, and planning for buffers around streams and forest connectivity, but implementation is uncommon. There is investment in the protection of natural forests, additional income from natural forest based initiatives like the UN's REDD+ program (Reducing Emissions from Deforestation and forest Degradation) and payments for ecosystem services, and some promising experiments in intercropping wattle with slower-growing native hardwoods. Finally, local people, calling themselves forest growers and forest protectors, are using opportunities like wattles to secure their social and economic future.

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Figure 1: Wattle scenes in A Lưới district, Vietnam. Row 1: Harvesting wattle for woodchips. Row 2: Plantation landscapes. Row 3: Seedling nursery and burnt re-seeded wattle plot. Row 4: Plantation impacts on soil and hydrology; (right) wattles as hedge trees on path to home. Photos by CK except 4a (DN) and 4b (RC).

520 **Table 1**: Estimates of surface area of forest plantations (all types) and plantations of Australasian
521 *Acacia* species in Vietnam per year. Overall forest plantation area is official government data (source
522 MARD). Note that 'unofficial' plantings are likely to be underreported (Midgley *et al.*, 2017).

year	All forest plantation (ha)	of which wattle plantation (ha)	Ratio of wattle to overall plantation area	Comment / further information on wattle plantation	Source for wattle data
~1960		few		early forestry trials of *Acacia mangium*, *A. auriculiformis*	
1976	92,000				
1985	584,000				
1990	700,000				
1992		66,000 – 80,000	roughly 10%		Nambiar *et al.* (2015); Midgley *et al.*)1996)
1995	1,050,000				
2000	1,471,000				
2002	1,919,568	120,000 to 400,000	6 to 21%		S. Midgley (personal communication, Feb. 2022); Byron (2014)
2005	2,333,526	400,000 to 500,000	17 to 21%		S. Midgley (personal communication, Feb. 2022); Nambiar *et al.* (2015)
2009	2,929,538	400,000	14%	of which 120,000 ha *A. auriculiformis* and ~230,000 ha of hybrid acacia (also: total acacia area in SE Asia 2,080,000 ha)	Kha *et al.* (2012); Griffin *et al.* (2011); Sein and Mitlöhner (2011)
2011	3,083,259	941,514	31%		VAFS data in Byron (2014)
2012	3,229,681	1,199,000	37. %		Byron (2014)
2013	3,556,294	1,095,000	31%	of which 600,000ha *A. mangium*; 90,000 ha *A. auriculiformis*; 400,000 ha hybrid acacia; 5000 ha *A. crassicarpa*	Nambiar *et al.* (2015)
2014	3,696,320	1,529,400	41%	includes 940,000 official and 649,000 estimated unreported	Midgley *et al.* (2017)
2017	4,178,966	1,550,000	37%		S. Midgley (personal communication, Feb. 2022)
2018	4,235,770	2,100,000	50%		MARD in Arnold *et al.* (2022)
2020	4,398,030	2,800,000 to 3,630,000	65 to 85%	back calculated from "13% of Vietnam is tree plantations, of which 65–85% is acacia"	MARD (2020)
2021	4'573,444	2,200,000	48%	of which 1'700'000 smallholder owned	Arnold *et al.* (2022)

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526 **Table 2**. Livelihood sources in Hương Nguyên (HN) and A Roàng (AR) communes, A Lưới district,
527 Thừa Thiên Huế province (Nguyen, 2021 and V.H.T. Nguyen, unpublished data).
528

Category	Description	% household income	Additional information
Tree and Forest Products			
Plantations	Wattle and rubber plantations	35-46%	Wattle: between 30-40m (AR) and 50-60m (HN) VND/ha/4 years; Rubber latex: between 100-200 kg/ha (AR) and 200-400 kg/ha (HN) (price of latex: 1000-7000 VND/kg)
Timber from natural forests	Income from sale or wages (note: illegal, excluding personal use for house or furniture)	[illegal]	Allowed: 2-5m^3 for building new house
Non-timber forest products (NTFPs)	Mostly rattan and honey; mushroom, bamboo shoots, medicinal plants, wild vegetables, and wildlife.	3.5% in HN, 22.4% in AR	Mostly for household use; not much income in HN because the natural forests is too far; in AR rattan early 3-4m VND/month/household for half the year
Tree and Forest-related labour			
Payments for eco-system services	Payments for protection work under PES schemes for households and community owners	1.7% in HN 2.5% in AR	400'000 VND/yr/household in HN; 1.2–2m VND/yr/household in AR (includes subsidies for restoration)
State forest protection	Salaried contracts with state forest owners	[not included]	A few AR villagers work for Saola Nature Reserve: 7-10m VND/month
Plantation labour	Wages for planting, weeding, tapping, harvesting, sawing and other diverse projects.	34.8% in HN 25% in AR	200'000 (AR) to 250'000 (HN) VND/day for men 180'000 (AR) t0 200'000 (HN) VND/day for women
Non-forest			
Paddy	Rice cultivated in paddy fields	[self-consumption]	Household use; production varies from 2000-3000 kg/ha in HN to 4000-5000 kg/ha in AR (two harvests/yr)
Livestock	Income from selling cows, buffaloes, pigs, chickens, ducks etc.	[self-consumption]	
State payments	Government salary, pensions (e.g. army), or subsidies for poor households, ethnic minorities, or dioxin victims	10.4% in HN 5% in AR	0.5-5m VND/month
Business	Restaurant/shop, furniture making, sawmill, motor repair services, or selling handcrafts	[not included]	Small portion of families. Except handicrafts (weaving) is 3.9% of income in AR.

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Box 1. Profiles of diverse 'new forest people' in upland villages based on key informant interviews (Nguyen, 2021).

Member of Focus group #8: "*We are ethnic minority people (người dân tộc). But we are no longer working on swidden cultivation, illegal logging, or hunting. We are smallholder tree growers. We play a role in helping the state in their efforts to protect forests and re-greening all barren hills surrounding here. The (wattle and rubber) tree plantation is now a crucial part of our livelihood. We also participated in many forest protection programs and were allocated natural forests for our own. We have our new lives.*"

Mr. P and Mrs. L: This 45-year-old couple were early adopters of wattle and describe themselves as "*forest growers*", with 10 ha of wattle and 3 ha of rubber, starting from none in 2003. They abandoned other activities, like rice and livestock, to focus on wattle for its ease and profitability, allowing them to attain an unprecedented level of material comfort. Mr. P stated: "*I am not a forest destroyer anymore but helping the government to restore the landscape, at the same time, we gain money and can send our children to cities. I feel we are now not that different from local people from the lowlands. Wattle plantation makes this huge change.*"

Mr. H: Now a 65 year old wattle farmer, in the early 1990s, Mr. H was a local police officer assisting state forest owners in catching illegal loggers. But he gave up, as he thought the nationalization of forests for timber extraction and exclusion of local users was unfair, and he participated in illegal logging himself. He observed that state forest owners switched in the early 2000s to forest protection instead of exploitation. But "*...they can't protect the forests. How can one officer protect 1000 ha. They even abet illegal loggers (to be honest, like me). They are just outsiders. They simply come here to work, receive a monthly salary, and then go home. They have no motivation to protect the forest here."*

When asked who should carry out forest protection, Mr. H said, "*The locals, of course*". Starting in 2011, Mr. H's village was assigned to manage and protect nearly 100 ha of natural forests. Mr. H was elected as chairman of the community forest management council. "*I am a forest protector,*" he said. For people like Mr. H, forests are their living environment, their memories, the place they belong. They now have a chance to protect their village's forests: "*For us, it is life, it is the way we live,*". The national Payment for Forest Ecosystem Services program has, in Mr. H's case, led to payments of USD 22-87 per year per household for the protection of that community forest, accounting for 3.5-13% of average household annual income.

Mr. M and Mrs. V: This young and land-poor 30-year-old couple spoke of wishing – unsuccessfully – to become tree growers and forest protectors., They mainly work on other peoples' rice, wattle, and rubber lands. Ten years ago, Mr. M worked at a wood factory in Da Nang City, but was cheated of his wages and returned home empty handed, and as a result ended up working for (illegal) loggers: "*I have no choice. I know being illegal logger now is not good at all, but I have no choice*."

With the hope of earning some money from the forest protection program, Mrs. V joined a group of households receiving an allocation of forest lands. But she complained: "*We don't get the trust of the other villagers as they all know what my husband does. I felt embarrassed when I signed the commitment to protect the forest. My father-in-law, a war veteran, is very disappointed because he spent all of his life helping the government, and his son now becomes an illegal logger*?"

The community looks at them with disdain, mistrusts them. They weren't asked to participate in planting rattan in their group household forests. Yet they yearn to become 'normal' villagers: "*If I had enough land to grow wattle, for example, about 2-3 ha, I also want to stay at home to be near my wife and children and focus on doing business. There is no joy in being an illegal logger when you have to stay in the forest, forest rangers raid, break the law and endanger life*"

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