

## Article

# Livelihoods and Land Uses in Environmental Policy Approaches: The Case of PES and REDD+ in the Lam Dong Province of Vietnam

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**Abstract:** This paper explores assumptions about the drivers of forest cover change in a Payments for Environmental Services (PES) and Reduced Emissions from Deforestation and Degradation (REDD+) context in the Lam Dong Province in Vietnam. In policy discourses, deforestation is often linked to ‘poor’ and ‘ethnic minority’ households and their unsustainable practices such as the expansion of coffee production (and other agricultural activities) into forest areas. This paper applies a livelihood framework to discuss the links between livelihoods and land use amongst small-scale farmers in two communities. The findings of the livelihood survey demonstrate no clear linkages between poverty levels and unsustainable practices. In fact, the poorest segments were found to deforest the least. The ways in which current PES and REDD+ approaches are designed, do not provide appropriate solutions to address the underlying dimensions of issues at stake. The paper criticizes one-dimensional perspectives of the drivers behind deforestation and forest degradation often found in public policies and discourses. We suggest more comprehensive analyses of underlying factors encompassing the entire coffee production and land use system in this region. Addressing issues of land tenure and the scarcity of productive lands, and generating viable off-farm income alternatives seem to be crucial. Sustainable approaches for reducing deforestation and degradation could be possible through engaging with multiple stakeholders, including the business-oriented households in control of the coffee trade and of land transactions.

**Keywords:** Vietnam; drivers of deforestation; livelihoods; environmental policies; REDD+; PES

## 1. Introduction

Tropical deforestation has been identified as one of the main global environmental challenges, contributing to a major share of the global emissions of greenhouse gasses and to the loss of biodiversity and ecological integrity worldwide [1]. At the same time, tropical forests are key arenas for livelihoods and outcomes for indigenous people and forest communities. Over recent years, the process of establishing a global mechanism for Reduced Emissions from Deforestation and Degradation (REDD+) has increased the focus on saving tropical forests. This has prompted a number of tropical forest countries to develop policies and prepare for reducing greenhouse gas (GHG) emissions from forests. However, the lack of progress in global climate change negotiations and in establishing a global REDD+ mechanism has stalled the process and also led to a diversity of approaches and adaptations of REDD+ in many countries [2].

In this paper, we use a case study from Vietnam to explore assumed and real processes driving forest cover change, and scrutinize some of the approaches taken for REDD+. In the Central Highlands of Vietnam, small-scale coffee production has been identified as a major driver of forest cover loss,

and it is also frequently associated with other negative environmental and social consequences, such as soil erosion, and economic and political marginalization of ethnic minority groups [3–5]. Various policy schemes to decrease environmental degradation and reduce poverty levels have been developed and implemented. Recently, innovative, results-based policy initiatives such as Payments for Environmental Services (PES) and REDD+ have been introduced to attempt to alleviate some of the problems. A predominant argument in forest-related policy discourses is that poverty and general low knowledge levels among ethnic groups often lead to sub-optimal and unsustainable livelihood decision making [6]. The poverty-deforestation link is not unique to Vietnam, but can be identified in readiness processes of various REDD+ countries, as documented by, for example, Dooley et al. in their review of Readiness Preparedness Proposals (R-PP) submitted to the World Bank Forest Carbon Partnership Facility (FCPF) [7].

In Vietnam, dealing with the (perceived) negative linkages between poverty levels and environmental degradation has frequently been associated with the need for awareness raising and reducing poverty rates among indigenous groups [4]. Such aims are explicitly expressed in national forest-related policy documents and discourses, such as the Lam Dong Province Provincial REDD+ Action Plan ([8], p. 8):

*‘Ethnic minority people in particular, have been carrying out deforestation and converting forest land to settlements and agricultural land to support their traditionally very large families. Awareness raising amongst both male and female members of the community is needed to reduce population growth and the deforestation associated with it.’*

This paper uses an empirical case study of the interrelationships between livelihoods and land use to investigate policy assumptions about the drivers of land use change. In Vietnam, the coffee sector, and poor people in particular, are often blamed for deforestation processes, and this sector and group of households are therefore frequently targets of environmental programs, such as PES and REDD+. The study demonstrates the shortcomings of one-dimensional analyses of drivers of land use change in policies that aim to reduce deforestation and degradation. We argue that poor people do not deforest the most, and that targeting the coffee sector will be a challenging task unless the reforms are embedded in wider structures of the coffee industry. The focus on linking the direct drivers of change to small-scale coffee production by poor households seems to mask many of the underlying factors, such as longer-term ‘control’ and vested interests of state-owned coffee companies and the more wealthy segments of the population in maintaining a particular mode of production. Therefore, REDD+ projects are likely to fail in achieving their goals of reducing deforestation and degradation if they are targeted only at the poor, and omit the structural determinants of the coffee sector at large.

PES has been introduced in the area to cope with smallholder expansion of coffee. Based on the findings, we reflect upon the magnitude and scale of forest conversion caused by the expansion of small-scale livelihood-driven coffee production. We also investigate the social and environmental impacts of the local PES scheme. PES is also likely to become a key component of REDD+ in Lam Dong, and the paper therefore discusses the implications of the findings in terms of practical policy implementation, particularly in view of the ongoing and planned REDD+ pilot activities in the area.

More concretely, the paper explores the following research questions: (1) How do households manage and diversify assets and resources to generate livelihood outcomes? (2) What are the impacts of PES policies on livelihoods, environmental awareness, and deforestation? (3) How do the overall production structures of the coffee economy affect livelihoods and deforestation processes? (4) What are the potential implications for emerging REDD+ policies?

The paper starts by outlining the conceptual models considered relevant for the study. This is followed-up by an introduction of the methodology and case study context. Considering the high degree of market integration and the presence of various policy schemes, analyzing the overall context and dynamics of the coffee sector and policy schemes is crucial for understanding livelihoods and land use in the study area. The final section discusses the results in view of livelihood outcomes and policy implications for REDD+ and PES schemes.

## 2. Conceptual Framework

This paper investigates households' livelihoods and the implications for land use and deforestation in the study area. These findings are further used to analyze policy assumptions about 'poor' and 'ethnic' households and their alleged unsustainable land-use practices that tend to be prevalent in policy documents and other discourses. Perspectives from livelihood theory, political ecology, and land-use change theory consequently inspire the conceptual framework for the study.

We applied a livelihood framework (LF) to identify differences in livelihood adaptations, and the role of small-scale coffee production in local land-use changes and deforestation. According to the LF, households combine various capitals, such as natural, physical, human, social, and financial capitals, to generate livelihood outcomes in the form of agricultural and forestry outputs, and off-farm and business oriented income [9,10]. Hence, the determinant relationship between the households' asset portfolios, livelihood strategies, and outcomes is at the core of the LF. Institutional factors, such as property regimes, markets, local values, attitudes and norms, skills, and various other social institutions and decisions taken at multiple scales, also affect access to assets and livelihood decision making in households [9,11]. The clearing of forests and expansion of agricultural areas are important components in the livelihood strategies of households [12].

Defining the relevant drivers of deforestation and degradation has been identified as one of the main challenges in developing efficient and effective REDD+ strategies and policies, and is a field that requires further research [13,14]. The land-use change literature frequently differentiates between *proximate* (direct) and *underlying* (indirect) causes of environmental change [15–17]. In our case study area, smallholder coffee production could be viewed as a main *proximate* driver of deforestation. In policy discourses, this has often been linked to livelihood and poverty as *underlying* drivers [8]. Our argument is, however, that there is a need to look beyond the livelihood and poverty dimensions in order to understand the broader issues surrounding coffee production and land-use change processes in the region.

The dynamics of the drivers of deforestation have changed over time and space in different parts of the world. In a meta-analysis of place and time-specific case studies, Rudel et al. detected a general trend from small farmers as a main agent of deforestation in the pre-1990 period, towards more agribusiness related activities in the period after 1990 [18]. In Vietnam the deforestation trends have often been characterized by large-scale deforestation processes of so-called 'slash-and-burn' and state-led deforestation in the 1970s and 1980s, towards more smallholder-oriented expansions of commercial agriculture in certain areas of the country in the 1990s and 2000s [19].

Nevertheless, making wide generalizations about the drivers of environmental degradation often masks the complexities of such processes. Tim Forsyth has termed widely accepted assumptions of the drivers of environmental change as 'environmental orthodoxies' ([20], p. 52). Such orthodoxies have been predominant in Vietnam, frequently obscuring many other underlying factors of change [21]. Notions about ethnic people's unsustainable practices in Vietnam were formerly linked to 'slash-and-burn' agriculture. However, such perceptions are also found in relation to the expansion of smallholder coffee production, as demonstrated by the quotation from the Lam Dong REDD+ Action Plan above. In this sense, the way REDD+ has been conceived in Vietnam risks ignoring important dimensions and actors involved, particularly in the coffee sector and related land-use change processes. Defining forest benefits and compensations should not only relate to the 'indigenous' and the 'poor', but acknowledge the diversity of concerns about, and benefits generated from, forests [22].

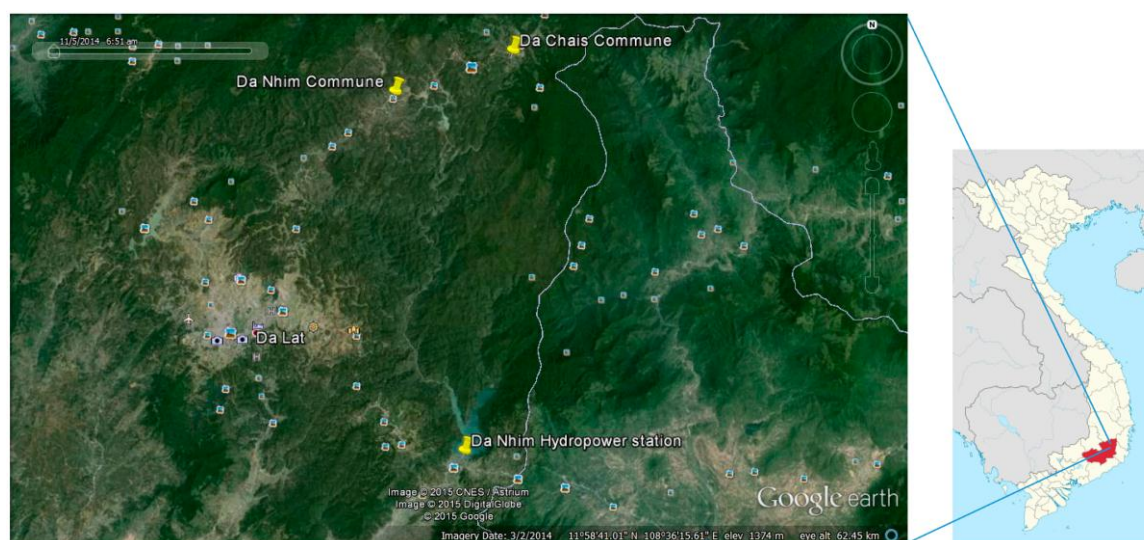
## 3. Methodology

In order to respond to the research objectives and questions presented above, the study adopted a case study approach. The data collection instruments included a household survey and in-depth interviews with farmers, policy makers, researchers, and government officials at national, provincial, and commune levels. The findings were triangulated against other socio-economic and qualitative studies carried out in the region, such as Hoang et al. [6], Tran [23], and Ogonowski and Enright [24].

The following sections describe the case study area and key approaches used in the collection and analyses of data.

### 3.1. Case Study Area

The fieldwork was carried out in the Lam Dong Province (Figure 1) which has a population of 1,259,300 (2014) [25] and covers an area of 9764.8 km<sup>2</sup> [26]. The province is landlocked, and characterized by upland environments. The average elevation is approximately 1500 meters above sea level. Precipitation is irregular in space and time, ranging from 1600 to about 2700 mm [26]. The variations in landscapes and precipitation contribute to exceptional bio- and ecological diversity [27].



**Figure 1.** Study sites of Da Nhim and Da Chais, Lam Dong Province, Vietnam, 2016. Maps generated from Google Earth and Wikipedia [28].

Historically, the economy of the province has been based on agriculture. General development trends need to be understood in the light of large-scale immigrations of people in the 1970s and 1980s, both as a result of government policies to inhabit, develop, and control the Central Highlands [29], and of people from the region seeking refuge from war and unrest. More recent immigrations have taken place through people seeking new economic opportunities, mainly related to commercial agriculture, such as the production of perennial crops (mainly coffee, rubber, and tea), vegetables, and flowers. Another factor was the resettlement of various ethnic minority groups that had traditionally practiced shifting agriculture within the region. These were situated in residential areas during the government's large-scale 'fixed agriculture' schemes of the 1970s and 1980s [21]. The combination of the displacement of people, voluntary migrations, and government land confiscations caused losses of rights to ancestral lands for various ethnic groups, and increased conflict levels over access to land and natural resources [30]. In the Lam Dong Province, land-use change and deforestation have been closely associated with the marginalization of ethnic minorities, land confiscations, forced resettlement, migrations of people, and last but not least, the integration of agriculture and local communities into a market economy [27]. Recent studies have also revealed trends of displacement of shifting cultivation for annual crops into forest margins, indirectly driven by the expansion of perennial commercial crops (mainly coffee) on agricultural land, a direct manifestation of the marginalization of ethnic groups in the Central Highlands [5].

Historically, coffee was not an important agricultural crop in Vietnam. It was initially introduced by the French colonialists as a plantation crop but during history, small-scale farmers have also widely



adopted it as a cash crop [31]. During the late 1980s and 1990s, coffee production exploded, and within a decade or so, Vietnam became the world's second biggest coffee producer [32]. Key reasons for this dramatic development related to a large extent to the economic and agricultural transformation processes of the market liberalization processes (often referred to as the *doi moi*) that started in the mid-1980s [33]. The shift also related to conscious government policies of improved credit facilities, research and development, general extension activities, tenure reforms, and foreign investment [34]. The government policies have been driven by a wish to commercialize and increase the number of (agricultural) export products in order to stimulate economic growth (Figure 2). Today, coffee is grown in a variety of locations and types of farmers, ranging from small-scale household producers to larger plantations [32]. The commercial coffee production has also spurred the emergence of private businesses locally, linked mainly to coffee trading, fertilizer provision, and resale and general trade in farm supplies [35]. The great influx of people to the Central Highlands to grow coffee have, however, caused tensions and conflicts over productive land between majority Viet (Kinh) people and various ethnic minorities.



**Figure 2.** “Grow coffee to increase the number of products for exportation”—propaganda poster for promoting coffee production in Vietnam.

The Vietnamese state has also played a very active role in the promotion of the coffee sector in the country, and continues to have an interest in its development and continued growth. In 1995, the National Coffee Corporation (VINACAFE) was established by the government under the auspices of the Ministry of Agriculture, with the mandate to organize trade and develop the coffee sector in the country [36]. Its mandate has been very diverse, ranging from implementing government policies, research, extension services, quality control, and acting as a major commercial actor controlling a major share of the coffee export [31,37].

In the late 1990s, a collapse in global coffee affected the sector negatively, including the coffee producing households and their livelihoods, demonstrating the potential vulnerability of basing livelihoods single-mindedly on producing for a global commodity market. In recent years, fluctuating global prices, high debt levels, and bankruptcies amongst banks and key investors continue to negatively impact the sector, including the economy of VINACAFE [38]. Debt levels have reportedly also increased amongst rural households in coffee-producing zones, including the area in which this study was undertaken [6]. This indicates that the integration of rural livelihoods into a global (coffee) commodity market have caused households to become more vulnerable to commodity price fluctuations. Studies have also revealed big differences between ethnic groups in terms of abilities to adapt and cope with price fluctuations, with the Kinh demonstrating higher capacities to diversify livelihoods and income sources as compared to the minority groups [39].

The agricultural system related to coffee production in Lam Dong is characterized by the *homeland* production. ('Homeland production' here does not refer to home gardens, but rather to agricultural fields close to the house. These are normally areas of land that are denominated and certified for agricultural use of coffee in combination with persimmon and vegetables), and the *hillside* production of coffee, sometimes mixed with persimmon and maize for subsistence. The homeland areas are certified agricultural land, while the hillside coffee plots are farther away and are often the result of illegal clearing of forests. Today, coffee production is considered to be a major driver of land-use change, causing the loss and degradation of large forest areas [4,5,40]. By reviewing the production statistics of Lam Dong in the 2002–2011 period, Tan [3] demonstrated that the expansion of coffee production in Lam Dong do seem to correlate with a rise in the price of coffee.

In order to reduce environmental degradation and enhance social development in the rural areas, a number of forest policy reforms and plans have been designed and implemented since the early 1990s. These include the '327' and the '661' programs (the 661 program is also known as the Five Million Hectares Reforestation Program). These programs had the twofold objectives of conserving the remaining forests and expanding tree cover on the 'barren' lands by means of large-scale replanting of trees [41]. In the Lam Dong area, the extent of forest plantations has increased from about 27,000 ha in 1999 to almost 66,000 ha in 2011 [42]. However, official data records show that in recent years in the overall region of the Central Highlands, the negative trend of deforestation has continued.

Following the Ministry of Agriculture's forest land classification system, forests are classified as *special use*, *conservation*, or *production* forests [41]. A key approach to reducing deforestation has been to establish national parks categorized as *special use* forests and large areas categorized as *protection* forests. The latter category has the purpose of conserving key environmental functions and services, such as water provision, energy production, soil protection, and protection against extreme weather events. *Production* forests are intended to be plantations that allow the production and sale of timber and non-timber forest products, in combination with environmental protection practices [43]. In Lam Dong, the relative proportion of *protection* and *special use* forests is quite high compared to *production* forests. There are two large national parks in Lam Dong (Cat Tien and Bidoup-Nui Ba), both of which are categorized as *special use* forests. The forest classification and tenure regimes provide guidelines for what types of activities are allowed on forest land, representing a rather strict system for controlling activities and resources. This, in turn, has important implications for access to land, land use, and livelihood outcomes.

Forest tenure reforms and the distribution of forest land to individual households have been carried out in Vietnam to varying extents. In Lam Dong, state entities such as the State Forest Enterprises, Forest Management Boards, and People's Committees still control most forest land. Only 1% of forest land is managed by individual households. On the other hand, many households in the area have agricultural land certificates (*red books*) to their homeland areas [4].

### 3.1.1. PES in Lam Dong

Since 2008, Lam Dong has been a pilot province for the national PES program [44]. Even though the prospects for successful PES implementation were described as meagre [45], the Vietnam PES ‘experiment’ is today often regarded as a successful case, and frequently used as a showcase for other countries in the Mekong Region and Southeast Asia (see, for example, [46]). This is mainly due to its scale and ability to generate substantial amounts of funds.

The pilot scheme for PES was established in Lam Dong and Son La provinces already in 2008 [47], and in 2010 it was scaled up as a nation-wide policy [48]. The Vietnam Forest Sector Development Fund (VNFF) is responsible for channeling, managing, and coordinating the PES funds. During the piloting phase in Lam Dong, 9870 households were included in the scheme covering nearly 210,000 ha of forest [49].

The poverty reduction objectives of PES (and REDD+) are emphasized in various policy documents, and must be understood within the general objectives of the 2006–2020 Vietnam Forestry Development Strategy [50]. This strategy identifies poverty reduction and socio-economic development as key objectives of the forest sector. On the other hand, PES in Vietnam has been criticized for elite capture of financial resources and for failing to target the underlying causes of environmental degradation, such as contested land rights and the general lack of participation and involvement in resource management [51,52].

The critique of PES also includes a general lack of clear linkages between payments and performance [4,53]. In Lam Dong, the PES setup implies a *forest leaser model* in which households, either individually or collectively, are hired by the state forest owners to look after forest land. This work is organized in so-called ‘forest protection groups’ that are collectively responsible for monitoring and controlling forest land. In this sense, the contracts and duties resemble labor contracts more than anything else, and disbursements are based on participation, rather than performance. The performance component of PES was reportedly rejected in Lam Dong due to resistance and lack of understanding as to why some households might receive higher payments than others [53]. With the implementation of REDD+, however, it is planned that the performance component of forest protection will be reintroduced in Lam Dong [8].

### 3.1.2. REDD+ in Lam Dong

Vietnam was approved as a UN REDD Programme country in 2008, and was later granted a second phase of support. In addition, the country has received readiness support from the World Bank Forest Carbon Partnership Facility (FCPF). During the first phase of REDD+, activities were limited to testing approaches for participatory carbon monitoring, and free, prior and informed consent (FPIC). In UN REDD Phase II, five more provinces were added, all of which have developed provincial REDD+ action plans (PRAPs) that detail funding streams and more concrete activities to be tested for relieving pressure on—and increasing—forest areas in Lam Dong. In total, over the five years of implementation, the PRAP has a total budget of 1,749,275 million VND, equivalent to about 83.3 million USD [8].

In anticipation of a global results-based REDD+ mechanism, the REDD+ Action Plan for Lam Dong is meant to be a coordination mechanism for various potential funding sources that are relevant in reducing GHG emissions from forests, and increasing forest carbon stocks [8]. Potential funding sources include Official Development Assistance, PES, REDD+ projects and programs (for example, by NGOs), and state-funded budgets. REDD+ will largely build on the institutional structures that were developed through PES [54]. Support for forest protection will continue to be channeled through the VNFF and carried out through the same system of forest protection groups. The results-based component that was ‘lost’ in PES will be reintroduced through REDD+. At the outset, the results-based component was meant to be linked to an extensive participatory carbon monitoring component. This aspect has, however, over time been toned down, and replaced by a conventional remote sensing data approach along the United Nations Framework Convention on Climate Change (UNFCCC) guidelines. This also forms the basis for Vietnam’s application for support through the FCPF Carbon

Fund [55]. Here the emissions reduction and removal potential for the six pilot provinces over the 2016–2020 period is estimated to be 20.66 MtCO<sub>2</sub>, equivalent of more than 100 million USD taking a price of 5 USD per tCO<sub>2</sub> into account.

The PRAP identifies small-scale agriculture, in part linked to ethnic minorities ‘unsustainable practices’, as a main driver of deforestation in the Lam Dong province. On the other hand, national level studies of the drivers of deforestation and degradation tend to put more emphasis on the links between coffee expansion and the forces and elasticities of the global coffee commodity market [19]. The apparent void here between the national broad sweeping analyses of the drivers of change, and the provincial and local level approaches of livelihoods improvement and diversification is striking. The PRAP’s REDD+ activities include components of training of farmers in agricultural techniques (with a focus on intensifying production in the form of more coffee per unit of land), and establishing village development funds to provide farmers with favorable loans in order to stimulate the establishment of alternative livelihoods [8]. In addition, it includes components of increasing the economic value of agriculture, cultivating multipurpose tree species that can contribute to diversifying income, planting more trees (forest rehabilitation) (similar to the 661 program approaches, except that tree species should be indigenous), and promoting livestock as a way of diversifying household economies. [8]. Nevertheless, how—and to what degree—REDD+ aims at targeting the underlying structures of the coffee sector at large remains unclear in current plans and approaches.

### 3.2. Study Sample

For the survey, we selected the two communes Da Nhim and Da Chais in the Lac Duong District of Lam Dong, with 2009 populations of 3347 and 1339, respectively [23]. A total of four villages were randomly selected from within the communes, and 25 households were interviewed in each village. This constituted a total sample of 100 households of the 915 households in the two communes. The ethnic composition of households is similar in the two communes (about 85% *K’ho*), and thus the *K’ho* constituted 85% of our total sample. The remaining households were *Kinh* (14%) and *Tay* (1%). With regard to socio-economic status and land use (in particular agricultural expansion), the Lac Duong District contains some of the more inaccessible areas in the province, as well as a high percentage of ethnic minorities [27]. In this sense, the communes are representative of the economically more marginal—but forest rich—areas of the province. In both of the communes, forest areas are predominantly of *protection* type (according to the Ministry of Agriculture forest classification system). In addition, in Da Nhim there are certain areas taken out of the official forest classification system that are categorized as *unclassified forests* that potentially could be used for ‘planned deforestation’ activities (including for hydropower, mining, ecotourism, and agriculture) [56].

The two communes were considered to be representative of the PES household population in the province, as they form key areas for PES and REDD+ policy implementation within the Da Nhim watershed. In this context, the Da Nhim hydropower station is the customer, buying environmental ‘services’ (water for energy production) from the forest owners (the Da Nhim Forest Management Board (DNFMB) and the Bidoup-Nui Ba National Park (BNBNP)) for managing the upstream forests. The forest owners in turn contract households to conserve and manage forests sustainably in order to provide water to the hydropower station. Households are trained and paid to carry out community patrolling of the forests. The approach and implications for the households in terms of training, duties, and remunerations are similar for the contractual arrangements with the DNFMB and the BNBNP. According to the information we received at the commune and province levels, households are selected based on ethnicity (minorities are prioritized) and income (the poor are prioritized). Seventy-nine of the households in the sample participated in PES, constituting 18% of the 450 households targeted through PES schemes in the area [6].

The REDD+ pilot activities of the Lam Dong Provincial REDD+ Action Plan started in the area only after we had conducted our survey. Our reflections around REDD+ impacts and implications are



therefore based on reviews of policy documents and in-depth interviews that we carried out before the REDD+ activities were implemented in the communes and after the survey.

### 3.3. Data Analyses

#### 3.3.1. Investigating Livelihoods

We investigated livelihood assets, activities, and different sources of income (including agriculture and various off-farm activities) from different households. This provided information about differences in land use. In order to further investigate the factors that determine income, we ran a multiple regression model of total income against various socio-economic assets [10]. We assumed that income is dependent on financial, physical, social, human, and cultural capitals. Households were also categorized into three equal-sized income groups ('poor', 'medium', and 'better off') based on yearly income in order to investigate differences in livelihood income sources, priorities, and decision making in relation to land use. Here we used pre-PES income levels (that is, total net income without PES) as the basis for the income categorization. This was done in order to capture the poverty dimensions predicted in policy documents regarding the manner in which households in the area were selected for PES (categorizing the households based on total net income, including PES, gave a different distribution of households as compared to without PES. When running the total income model, 16 households were categorized differently as compared to without PES). The mapping of livelihoods and land-use practices feeds into the study of impacts of PES and REDD+ policies in the area.

#### 3.3.2. Measuring the Drivers of Changes in Forest Cover

Micro-studies of land use and decision making at the household level tend to be site specific, and it is often challenging to extrapolate results in space and over time [16,57]. However, we maintain that context-specific studies can introduce nuances in perceptions and orthodoxies about the drivers of land-use change that are widely accepted and often taken for granted, particularly in policies and measures that deal with environment and development issues.

In order to avoid potential biases of data, self-reporting on land use and land use change was consistently avoided in the survey. We did not ask people directly about whether they had cleared land or not. We calculated land-use changes on the respective households' land by combining in-field measures and observations. In total, 181 agricultural plots were walked and measured with GPS in the two communes. The data were stored as gpx-files and analyzed through various online tools, including Google Earth Pro and Landsat images developed by Hansen et al. [58] at a resolution of 30 m. This gave us an overview of changes in each measured land plot over the 2000 to 2014 period. In addition, feeding these data into GIS ArcMap base maps provided by the Lowering Emissions in Asia's Forests (LEAF) project gave us information about the types of forest categories in the various locations.

There are, of course, methodological challenges in combining time series data of this kind, with cross-sectional household income data, since household socio-economic factors change over time. We proceeded to use these data, with some caution, but we believe it is valuable in developing an indicative estimate of the average rate of forest-cover loss due to small-scale livelihood activities related to coffee production. Combining it with in-depth interview data on the coffee production system helps to contextualize policy discourses around the drivers of deforestation and environmental degradation.

#### 3.3.3. Investigating Policy Effects and Implications

The study investigated the effects of PES payments on livelihood and land use within various household categories. We assumed that the poorest households had been prioritized for PES and that this would have contributed to reducing income inequality in the communes. We used the PES proportion of total income as a measure of its importance in terms of poverty reduction. In order to consider to what degree different land use and investment rationales might be attributed to the

social and cultural status of households, we measured areas cultivated, input investments made, and yields per unit of land, and how these variables relate to income levels. The different ways in which various households have access to and manage land provided insights into the degree to which links between income levels and pressure on forests may be substantiated. This helped us to reflect upon the relevance and prospects of success for ongoing and planned REDD+ activities in the area.

Key strategies of PES and REDD+ are also to improve citizen environmental ‘knowledge’ and ‘awareness’. Measures to accomplish this include information campaigns, stakeholder meetings, and the use of media (television, radio, newspapers) [23]. For measuring changes in environmental attitudes, we developed a composite indicator. This indicator combines six different questions regarding awareness and perceptions of the value of forests and the conservation of forests. The responses were valued along a Likert type scale, (1–5 scale, 1 implying low awareness, 5 high). The responses were merged into an attitude awareness indicator where the potential score is between 6 and 30.

### 3.3.4. Misrepresentations of Coffee Income—A Methodological Challenge

A particular challenge we faced was that about 25% of the households reported net negative agricultural income. This may be or lead to a source of misrepresentation in the wealth ranking of households when the estimate of annual income is based on one particular year. In many cases, households will incur high initial, investment costs in establishing new coffee plantations which do not yield any crop income for three to five years [59]. The survey results show that many households established new plantations in 2010/2011, implying high input costs in terms of fertilizers and pesticides, combined with very low income (if any), resulting in negative agricultural income in the survey year (2014). The new plantation efforts in 2010/2011 may be explained by favorable *robusta* coffee market price trends, and expansive population trends, especially in Da Chais. Similar results have been found in other studies carried out in the area, such as the one by Tran [23]. We therefore believe that the negative income can be attributed to the “decoupled” or “disjointed” nature of costs and income distribution that accrued differently for various households over the time leading up to the survey.

In order to adjust this misrepresentation to a ‘smoother’, more longer-term income measure, we calculated a mean income value per ha, based on the mean gross value of coffee production of the households that produce coffee on their plots. We found that the mean gross coffee production was 3664 kg per ha (on a total area of 82 ha across the sample). We also found mean net investment to be just over 17.0 million VND per year, which conforms well with the national cost figures presented by Thang et al. [59] of an average of 16.9 million VND per year (approximately 846 USD). Based on this, we calculated the average net income per ha to be about 4.8 million VND per year.

We used these figures as an indicator of the net coffee income by household, multiplied by the land available per individual household. In this paper, we refer to this measure as the ‘coffee index-adjusted net income’. We then used this measure to categorize households into three, equal-sized income groups. The income adjustment caused 25 households to change income groups, in most cases moving one level either upwards or downwards. In order to maintain transparency in the analyses, the descriptive data (in Table 1) contain both the mean ‘indexed’ and ‘actual’ income values. We retain, however, the ‘index adjusted income’ in the statistical analyses (involving income groups), because we believe that it gives a more realistic picture of wealth and income levels amongst households in the communes in the study area.

**Table 1.** Socio-economic assets and income sources, Da Nhim and Da Chais communes, Lam Dong Province, Vietnam, 2014 ( $N = 100$ ).

Variable	Mean	Std Dev	Min	Max
Total net income (1000 VND)	48,480.72	92,810.94	−24000	774,000.00
Index-adjusted net income (1000 VND)	47,684.75	91,823.96	2403.3	789,004.27
Off-farm income (1000 VND)	30,737.50	94,218.92	0	780,000.00
Indexed-adjusted agricultural income (1000 VND)	6594.40	7232.19	0	50,388.32
Livestock income (1000 VND)	221.60	2649.39	−1000.00	26,400.00
Net income: fish (1000 VND)	129.00	831.37	0	6500.00
Net income: forests (1000 VND)	1952.97	3603.71	0	25,948.00
PES income (1000 VND)	7432.00	4966.21	0	16,400.00
Other environmental schemes (1000 VND)	617.28	2746.17	0	15,600.00
Household size	5.45	2.75	2	23
Age of household head	43.66	12.71	23	76
People available to engage in adult labor	3.23	1.98	1	13
Years of education of household head	4.27	4.10	0	16
Total value of assets (1000 VND)	144,606.30	339,807.40	5000.00	3,144,000.00
Debt (1000 VND)	34,170.00	111,399.00	0	1,000,000.00
Debt:income ratio	1.23	1.25	0	15.26
Total cultivated area (ha)	1.14	0.87	0	4.51
Total area of homeland (ha)	0.35	0.43	0	1.97
Area of coffee production (ha)	0.83	0.74	0	4.22
Gross coffee production (kg)	2887.17	3911.84	0	300,000.00
Input investments per ha (1000 VND)	15,761.77	14,734.69	0	65,502.18
Coffee production (kg) per ha	3423.30	3110.30	0	12,455.52
Average distance to land plots (km)	1.68	2.17	0	10.43
Area of land cleared (ha) (2000–2014)	0.35	0.43	0	2.04
Area of uncertified land cleared (2000–2014)	0.28	0.42	0	2.04

USD1 = VND 21,000. PES, Payments for Environmental Services.

#### 4. Results and Discussion

The objectives of this paper are threefold. First, we present general household characteristics and income levels, followed by an analysis of livelihood activities and outcomes per income group. The results mainly reflect the findings from the household survey, but in-depth interviews and secondary sources also inform the discussion—particularly in relation to understanding the production structure of the local coffee economy. The results section feeds into a discussion about how households manage resources differently in order to generate their livelihoods. Second, we measured the relative importance of PES income in household livelihoods, and the degree to which PES participation can be linked to differences between income groups, in terms of income and land use. Third, we explored the coffee economy and land use by investigating the relative importance of coffee production in household economies, and the links between household affluence and the expansion of coffee production into forest land. This discussion also reports on the general organization of the coffee economy in the area. Finally, this section ends with a discussion of future prospects for REDD+ in view of the findings of the study.

##### 4.1. Household Characteristics and Income Levels

The average household size was 5.5 members. The average age of the household head was 43.7 years, with an average level of education of 4.3 years (see Table 1). The level of poverty in the area is high. The mean net income for all households was found to be approximately 48 million VND per annum (Table 1), equaling a mean net income per capita of 8.7 million VND per annum. This equals about 1.1 USD per person per day, i.e. a very low income level as compared with global poverty level income standards of 1 USD per person per day. Nevertheless, seen in a national context, this income level is well above the national poverty rate for rural areas of 4.8 million VND per person per year [60]. Looking at the defined income groups for the study, the income levels again appear to be very low. Both the ‘poor’ (2.7 million VND per person per year) and the ‘medium’ (4.4 million VND per person per year) are below the national poverty rate for rural areas. Nevertheless, the registered

low income levels correspond with other income-related studies from the area, such as Tran [23]. There are also substantial income inequalities within the communes. The variations in net income levels demonstrate a range from about 1 to 798 million VND per household per year. The estimated Gini coefficient of the communes (0.56) shows that this is well above the national average of 0.39.

The main income source in the study area is off-farm activities (64.4%), followed by PES activities (15.6%), and agriculture (13.8%). Forestry (beyond PES) and livestock-related income are small (4.1% and 0.4%, respectively). Forest related income sources are subsistence oriented and predominantly involve collecting fuelwood. The main limiting factor for agricultural production in the area is the extent of available land [23], which partly explains the high degree of off-farm reliance amongst the sampled households. The households reported an average of 1.14 ha of cultivable land each, of which about 0.82 ha (73%) is used for coffee.

We ran an ordinary least squares (OLS) analysis to test the causal relationship between access to assets and total income ( $R^2 = 0.4932$ ;  $F = 4.8998$ ;  $p < 0.0001$ ) (Table 2). We found income to be positively correlated with the level of education of the household head, distance to land plots in general (regardless of whether it was ‘homeland’ or ‘hillside’), and the total area of certified agricultural land (homeland). We found a negative correlation between net income and the total cultivated area, indicating that the higher net income the less land households cultivate. On the other hand, and contrary to policy assumptions about the ‘poor’ and ‘ethnic’, the OLS indicates a positive correlation between income levels and clearing of land, namely that the households with higher income had cleared more land in the 2000–2014 period. Household participation in PES also correlated negatively with income. This is as expected, considering the expressed priority to include poorer households in PES.

**Table 2.** Total income by socio-economic assets, Dha Nhim and Da Chais communes, Lam Dong Province, Vietnam, 2014 ( $N = 100$ ).

Term	Correlation Estimate	Std Error	t Ratio	Prob >  t
Intercept	3221.43	40,867.85	0.08	0.9374
Village 1	−24,876.99	17,209.08	−1.45	0.1521
Village 2	−31,809.43	14,681.07	−2.17	0.0332 **
Village 3	3572.64	13,956.88	0.26	0.7986
Ethnicity (dummy = <i>K’ho</i> ethnicity)	8629.39	16,967.99	0.51	0.6124
Size of household	5657.58	5030.02	1.12	0.2640
Sex of household head (dummy = male)	−39,948.57	14,859.90	−2.69	0.0087 ***
Age of household head	469.95	677.98	0.69	0.4902
Adult labor	−5471.05	7347.30	−0.74	0.4586
Years of education of household head	6738.28	2456.36	2.74	0.0075 ***
Collective work Y/N (dummy = yes)	−6407.06	8595.69	−0.75	0.4582
Total value of assets (1000 VND)	0.01	0.03	0.44	0.6631
Debt (1000 VND)	−0.05	0.08	−0.64	0.5210
Total cultivated area (ha)	−39,122.85	13,779.20	−2.84	0.0057 ***
Total area of homeland (ha)	72,656.29	24,393.56	2.98	0.0038 ***
Average distance to land plots (km)	9231.01	3211.01	2.87	0.0051 ***
PES participation (Y/N) (dummy = yes)	−28,299.79	14,632.62	−1.93	0.0566 *
Area of land cleared (2000–2014)	91,889.36	27,096.12	3.39	0.0011 ***

$R^2 = 0.4979$ ;  $F = 4.8098$ ;  $p < 0.0001$ ;  $p$ -values estimate significance for differences between household assets:

\*\*\* is significant at  $p < 0.01$ ; \*\* is significant at  $p < 0.05$ ; \* is significant at  $p < 0.1$ .

Surprisingly, the OLS indicates that female-headed households generate significantly more income than male-headed ones (Table 2). However, this result is due to an outlier observation in the sample. The richest household in the sample was female headed, with about 798 million VND in total net income per annum. Omitting the outlier and re-running the test eliminated the correlation between gender and income. This also eliminated the correlation between income and location (village) (namely that location influences income levels). Since the outlier household was also ethnic minority (*K’ho*), the omission yielded a positive correlation between ethnic affiliation and income (the *Kinh* earning on average more than the *K’ho*).



In summary, the descriptive data indicate that income levels are low, with substantial differences between the wealthiest and the poorest households. The agricultural and forest-related income levels are also low. According to official statistics from 2014, the provincial mean income from agriculture, forestry, and fishery was 982,000 VND per capita per month [61]. By comparison, the survey data demonstrate an average per capita income from the agriculture and forestry of about 130,000 VND per household.

Breaking the income data down according to income levels—‘poor’, ‘medium’, and ‘better off’—provides more detailed insights into livelihoods and land-use dynamics for the various income groups. The results are presented in Table 3. The ‘better off’ households reported significantly more assets and resources than did the ‘poor’ and ‘medium’ ones. The level of education of the household head is also on average higher for the ‘better off’ than for the other two income groups. The differences in average household size and the average age of the household heads were statistically insignificant.

**Table 3.** Socio-economic characteristics, livelihood activities, and outcomes by income groups ( $N = 100$ ), Da Nhim and Da Chais Communes, Lam Dong Province, Vietnam, 2014.

Variable	Poor	Medium	Better off	<i>p</i> -Value
Household size	4.88	5.64	5.85	0.1276
Ethnic minorities (%)	91.20	100.00	63.60	0.0004
Age of household head	44.00	42.18	44.79	0.8030
Years of education of household head	3.53 <sup>b</sup>	3.15 <sup>b</sup>	6.15 <sup>a</sup>	0.0066
Total value of assets (1000 VND)	80,080.88 <sup>b</sup>	77,465.76 <sup>b</sup>	278,227.70 <sup>a</sup>	<0.0001 ***
Debt (1000 VND)	21,617.65	19,212.12	62,060.61	0.0866 *
Net income (coffee index-adjusted) (1000 VND)	13,081.92 <sup>b</sup>	24,803.05 <sup>b</sup>	106,217.86 <sup>a</sup>	<0.0001 ***
- Off-farm income (1000 VND)	333.82 <sup>b</sup>	4155.76 <sup>b</sup>	88,644.24 <sup>a</sup>	<0.0001 ***
- Paid work (1000 VND)	108.82 <sup>b</sup>	3422.42 <sup>b</sup>	78,352.73 <sup>a</sup>	<0.0001 ***
- Other business (1000 VND)	11.76 <sup>b</sup>	0 <sup>b</sup>	10,012.12 <sup>a</sup>	<0.0001 ***
- Income transfers (1000 VND)	213.24	733.33	279.39	0.8954
- Indexed-adjusted agricultural income (1000 VND)	2925.35 <sup>b</sup>	8611.93 <sup>a</sup>	8357.09 <sup>a</sup>	0.0007 ***
- Indexed-adjusted coffee income (1000 VND)	2294.47 <sup>b</sup>	5090.87 <sup>a</sup>	4501.64 <sup>a</sup>	0.0072 ***
- Agricultural subsistence income (1000 VND)	630.88 <sup>b</sup>	3521.06 <sup>a</sup>	3855.45 <sup>a</sup>	0.0153 **
- Forest related income	1296.27	2525.42	2057.13	0.3961
- PES income (1000 VND)	8529.41 <sup>a</sup>	9018.18 <sup>a</sup>	4715.15 <sup>b</sup>	0.0011 ***
Total cultivated area (ha)	0.70 <sup>b</sup>	1.47 <sup>a</sup>	1.27 <sup>a</sup>	0.0059 ***
Total area of homeland (ha)	0.26	0.35	0.44	0.0878 *
Area coffee production (ha)	0.48 <sup>b</sup>	1.06 <sup>a</sup>	0.94 <sup>a</sup>	0.0072 ***
Gross coffee production (kg)	1891.18 <sup>b</sup>	2757.58 <sup>a,b</sup>	4042.94 <sup>a</sup>	0.0123 **
Input investments per ha (1000 VND)	17,880.20	12,783.43	16,557.50	0.6793
Coffee production (kg) per ha	3836.37	2859.65	3561.37	0.7006
Average distance to land plots (km)	1.21	2.41	1.83	0.3202
Area cleared for agriculture (2000–2014)	0.23	0.42	0.40	0.0956 *
Area of uncertified land cleared (2000–2014)	0.11 <sup>b</sup>	0.34 <sup>a</sup>	0.40 <sup>a</sup>	0.0033 ***
PES participation (%)	88.2 <sup>a</sup>	100 <sup>a</sup>	63.6 <sup>b</sup>	<0.0001 ***

*p*-values estimate significance for differences between income groups: \*\*\* is significant at  $p < 0.01$ ; \*\* is significant at  $p < 0.05$ ; \* is significant at  $p < 0.1$ ; <sup>a-c</sup> Bonferroni test; groups with different letters are significantly different from each other ( $p < 0.05$ ); USD 1 = VND 21,000.

#### 4.2. PES Income and Land Use

There are large variations in the share of income by activity for the different income groups. The ‘better off’ have on average much higher off-farm income (83.0% of their total income and only 7.0% from agriculture) than the other two groups—the ‘poor’ and the ‘medium’ earn about 2.5% and 16.8%, respectively, off-farm. Off-farm income is derived from paid work, business activities, and remittances. In relation to ‘paid work’, the types of jobs vary—the ‘poor’ and ‘medium’ tend to be hired frequently for agricultural work on the land plots of other households’ (such as for commercial flower and vegetable production, and coffee production), while the ‘better off’ work in the commune administration, as teachers, or in the tourism sector. Business-oriented activities are carried out almost exclusively by the ‘better off’ families. All business households in the sample were ethnic *Kinh*.

PES income are relatively high in the area. The findings from the survey data regarding linkages between PES and performance objectives are still mixed. In the surroundings of the Bidoup-Nui Ba National Park, anecdotal evidence shows that the number of ‘violations’ has decreased since the start-up of PES [21,23]. The positive correlation between income and land clearing found in the OLS may also demonstrate a link between the level of PES payments and households’ expansion of agriculture into forest land. When we compared PES payments across income groups, we found that the ‘poor’ and ‘medium’ households receive the highest PES payments. This indicates that in terms of the poverty reduction objective of PES, PES has contributed to reducing income inequalities in the area. In other words, PES is relatively speaking more important for the ‘poor’ households than for the ‘medium’ or the ‘better off’ ones (respectively 65.2%, 38.7%, and 4.4% of total net income). Nevertheless, the ‘medium’ and the ‘better off’ households cultivate more land for coffee on average, and in this sense, PES has excluded an important segment of households that are more capable and more likely to expand coffee production.

A simple binary comparison of households in terms environmental knowledge and awareness also showed that there were insignificant differences between the PES (22.8) vs. non-PES beneficiaries (22.3) households ( $p = 0.5237$ ). This partly also questions the positive effects of the knowledge and awareness related activities carried out as a part of the PES scheme.

#### 4.3. Livelihoods, Land Use, and Coffee Production

The land-clearing data indicate that the households in Da Nhim cleared more land on average than in Da Chais in the 2000–2014 period (0.24 ha more on average). Much of the forest land clearing in Da Nhim is most likely attributable to the commune’s distribution of forest land for coffee plantations. Here the authorities have deliberately chosen to distribute forest land certificates for coffee plantations to relieve the pressure for improved livelihoods, to provide more land, and to encourage the expansion of coffee production towards areas perceived as less vulnerable in terms of the provision of ecological services. If we subtract the certified legal land clearings organized by the authorities, this gives us an indicative measure of the level of what is officially perceived as illegal land clearings in the area (hereafter referred to as ‘uncertified land clearing’). The average area per household across the two communes is 0.28 ha (Table 1), or 0.33 and 0.23 ha in Da Nhim and Da Chais, respectively. This may indicate that access to land is an even more pertinent political issue in Da Nhim than in Da Chais. Considering land use in relation to the various income groups, the ‘medium’ and the ‘better off’ households access and cultivate more land on average than the ‘poor’ (1.47 and 1.27 hectares vs. 0.70 hectares, respectively). On average, 72.8% of the cultivated land is used for coffee production. The ‘medium’ households cultivate the most land, both in total and for coffee production. The ‘poor’ households have less land than the other income groups. A modest significant difference in terms of land clearing in the 2000–2014 period was also detected between the groups (Table 3); that is, the ‘poor’ clear slightly less land than the other groups. Interestingly, however, if we compare income groups in terms of the level of uncertified land clearings in the 2000–2014 period, this is significantly lower for the ‘poor’ and highest for the ‘better off’ (though not significantly different from the ‘medium’). No significant differences were found in input investments or in productivity between the groups. Further, in terms of output per input investment (that is kg of coffee per 1000 VND), there were no big differences between the groups (i.e., 0.21 for the ‘poor’, 0.22 for the ‘medium’, and 0.22 kg/1000 VND for the ‘better off’).

The data collected during the in-depth interviews indicate that illegal clearing of forest land and land transactions are more complex processes than revealed through the survey data. Land clearing and land transactions often take place in a step-wise process, where the poorer households are paid by the richer and more business-oriented households to clear new land. Thereafter, the land is sold to the other coffee producing households. This was also observed in other studies, such as Vu Tien Dien and Grais [40] and the Netherlands Development Organization (SNV) [62]. Such transactions most likely represent a substantial (illegal) off-farm income source for some of the ‘business households’ in the

sample, a finding which was not well captured through the survey data. The numbers may have been reported as ‘business activities’, but they were not revealed as income from land transactions.

Business activities are carried out almost exclusively by the ‘better off’ households, and all of them are ethnic *Kinh*. They frequently own and run small or medium-sized businesses in the communes, typically shops where they sell food or agricultural articles, sometimes combined with cafés or restaurants. These households also provide other farmers with key agricultural inputs, and act as intermediaries for the sale of coffee. In these transactions, inputs are frequently sold on credit and the debt is then repaid in installments and interest in the form of a supply of coffee beans. In such cases, the debtors typically receive a lower price for their coffee compared to selling it directly in the markets (approximately 20% lower than the market price) [6]. This often results in the poorest households being caught in a vicious circle of debt and payments with inflated interest rates.

From a vulnerability point of view, concerns have been raised about the debt situation related to coffee production in the area [6]. The survey findings in this study demonstrate that the household debt levels are indeed high. Households have on average about 34 million VND in debt—some 70.5% of their total annual income on average (Table 3). Even though the differences in debt levels between households are statistically insignificant, the debt-to-income ratios for the ‘poor’ are much worse than for the ‘medium’ and ‘better off’ households (165% versus 77% and 58%, respectively). The levels of interest rates on debt repayments are similar between the different groups.

The better-off group hence has a stake in sustaining the current mode of production in the area, which may represent a major underlying factor for land-use change and forest encroachment in the area. Coffee production should hence be understood within a broader political, economic, and historic context, in which small-scale coffee producing farmers are part of a complex coffee economy, influenced locally by the business-oriented segment of the population that trades coffee, key inputs, and land. This system has been traditionally supported by the state, not only through input support and extension services, but also directly through the state-owned VINACAFE. This is the largest coffee trading and manufacturing company in Vietnam, accounting for 20% to 25% of the country’s coffee exports.

#### 4.4. Implications and Prospects for REDD+

While we agree in principle with the prominent role of the coffee sector as a driver of land-use change in the province, we challenge some of the predominant perceptions linked to the underlying poverty and livelihood-related explanation models found in key policy documents and discourses.

First, the findings question the role of smallholder coffee production in relation to deforestation in the study area. Considering the rate of land conversion evidenced through the survey gives reason to question the relative role of smallholder production in the overall picture of deforestation in the province. The land-use change data for the household plots in the 2000–2014 period indicate an increase in agricultural land of 0.35 ha (constituting about 31% of the total amount of agricultural land) (Table 1). This amounts to about 0.025 ha per household per year over this period. A simple calculation of the average total annual forest loss due to livelihood activities in the two communes yields an answer of 22.9 ha. With total forest cover of the two communes of 53,546 ha, the average loss due to household livelihood activities should be around 0.043% per year, which is well below the provincial average (about 0.5 ha per annum according to official figures from the Forest Inventory and Planning Institute [42]). These results are of course indicative figures, but considering that they are based on the current population of the communes, and since the population trend of the province has been increasing in recent years, the figures are probably not underestimating deforestation. It should also be noted that there are most likely differences in land-use practices and needs between locations in different contexts. The focus in REDD+ should hence also be on contexts where larger-scale plantation mode of coffee production is taking place.

Second, PES experiences should critically be reviewed and modified in REDD+. The way REDD+ has evolved is, to a large extent, symptomatic of how domestic REDD+ policies have evolved from global approaches and ideas, and in this case from an idea about results-based PES to more pragmatic

national and local adaptations of broader policies and measures [2]. REDD+ in Vietnam in general, and Lam Dong in particular, is by-and-large viewed as a coordination mechanism for ongoing and future activities that may contribute to the reduction of GHG from forests. Hence, we foresee that the current PES setup will play a key role as a distribution mechanism for financial benefits, particularly in relation to forest conservation, thus making the experiences with PES since 2008 in Lam Dong particularly relevant for future REDD+ prospects.

When comparing PES income with coffee production per unit of land, the opportunity costs of coffee production very significantly outnumber those of PES. The net average income per hectare per year from PES is about 298,000 VND, while alternative agricultural land use would constitute about 5.7 million VND. Thus, it seems reasonable to assume that any causal links between the (low) level of PES payments and environmental performance are highly uncertain. In order for a performance-based PES or REDD+ mechanisms to succeed sustainably, the opportunity cost levels of current land uses must be addressed. If PES has had any impact, it is most likely attributable to increased control and patrolling, and information campaigns that reach all households (for example, newspapers, television, radio, etc.), rather than participation and performance-based payments (effects that were also partly questioned by comparing the environmental awareness scores between the beneficiary and the non-beneficiary households—see Section 4.3 above).

Third, the ‘poor’ deforest the least. Our findings demonstrate that the ‘poor’ households are the ones carrying out the least uncertified (illegal) land clearings, and are hence not the group of households causing most deforestation in the study area. The planned REDD+ activities seem to a larger extent to recognize some of the underlying issues of deforestation in the area than has been the case with PES. For example, the establishment of the Village Development Funds may have the potential to stimulate livelihood diversification and relieve poor farmers of debt dependency in the form of high interest rates charged by business households in the communes. Nevertheless, as with PES, the focus on the ‘poor’ ethnic minorities and their ‘destructive’ activities is also a key component of REDD+, and the lack of comprehensive analyses of the coffee sector at large is striking in plans and policies at all levels.

An underlying assumption of current REDD+ activities is also that training and capacity building for better and improved practices will increase households’ agricultural investment returns, and in turn reduce the pressure on forests. Our livelihood analyses question the assumption that the production of ‘poor’ (and ethnic minority) households is economically and agronomically less efficient than that of wealthier households. Our findings do not reveal significant differences in levels of input investments, nor production per ha, and the data on the links between income levels and the expansion of production into forest land point to the higher income segments of the population. The effects of increasing the productivity of global commodity crops, such as coffee, are also uncertain in terms of decreasing pressure on more marginal lands, considering the high price elasticity of production levels and volumes [63].

Fourth, issues of tenure and access to productive land need to be addressed. Our findings point towards land being a major limiting factor for increased livelihood income. Issues related to sustainable access to productive land should be addressed in order to stop or constrain the illegal clearing of forest land. Improved land-use planning and securing legal and sustainable access to land for the poor and ethnic minority households should be a key component in all strategies aiming at relieving pressure on strategically important forest resources. This has been done in Da Nhim, to a certain extent, and could be a viable approach for directing coffee production strategically towards the less vulnerable areas in terms of environmental and carbon values. The interests of the business-oriented segment of wealthy households, who have a major stake in coffee-related businesses and (illegal) land transactions, seems to be a cementing factor for the current mode of production. These underlying factors need to be addressed before issues related to the expansion of coffee production into forest land can be solved in a sustainable way.



## 5. Concluding Remarks

The study has explored some of the predominant underlying policy ‘orthodoxies’ on the drivers of land-use change and forest encroachment related to small-scale coffee production amongst ‘poor’ and ‘ethnic’ households in a PES and REDD+ zone in the Lam Dong Province of Vietnam. Such perceptions are not endemic to Vietnam, but are frequently found in environmental policy schemes and discourses globally [20]. The study has explored drivers of land-use change by making use of a livelihood framework. We found that land is the main limiting factor for agricultural production and livelihoods, and most households in the study area need to supplement agricultural income with off-farm sources. Both the ‘medium’ and the ‘better off’ households have access to a more diversified set of off-farm income sources compared to the ‘poor’, who depend more upon agriculture for their livelihoods, both overall and in terms of coffee production. Policy discourses on the drivers of land-use change in the Central Highlands of Vietnam seem to neglect various underlying factors that drive the coffee production. The findings of this study also indicate that the coffee economy and land transactions related to the expansion of coffee production are controlled largely by the business-oriented households in the study area.

In terms of links between land-use change and poverty levels, the data showed that in absolute terms, the ‘medium’ and the ‘better-off’ households cultivate most land, both in total and for coffee production. The data also indicate that these households have cleared more forest land for agriculture over the years than the ‘poor’ households. Especially if we take the uncertified (‘illegal’) clearing into account, the ‘poor’ deforest the least. Thus, the focus on the linkages between poverty amongst the ethnic poor and coffee-related forest encroachment seems to be overrated in PES and REDD+ policies and discourses. The main argument of this paper is therefore that, in order to enable a more comprehensive understanding of land-use change and its management, the focus should be expanded beyond the poverty-environment nexus.

The expansion and development of the coffee sector in Vietnam must be seen in the historic and political context of marginalization of, and control over, land, resources, and people [21,30]. Historically, the general deforestation in the Lam Dong province has often been related to the large migrations of people from the north who came to populate and develop the province [27]. They represent a group of households that over the years have been encouraged by the Government of Vietnam to migrate, settle, and ‘develop’ the region. This study has demonstrated that business-oriented households, together with the state-owned coffee corporation (VINACAFE), are in control of the coffee sector in the region. Consequently, the current focus of PES and REDD+ on payments to ‘poor’ and ‘ethnic’ households, combined with education, information campaigns, and increased levels of forest patrolling, do not seem to be sufficient in trying to solve the underlying issues at stake.

Coffee production requires a long-term investment, and reverting to subsistence production is not a viable option for most households, considering their integration into a market and ‘cash’ economy. Solutions for attaining sustainable livelihoods need to address the critical lack of productive land in the area. Improved land rights and land-use planning seem to be warranted. The current development and infrastructure plans, for example, of larger-scale plantations of rubber in the Central Highlands also require more attention [64]. A focus on creating realistic and viable off-farm livelihood alternatives, other than being involved in the very dominant coffee sector, is most likely an important ingredient in any policy scheme that aims to reduce pressures on forests.

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