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International Journal of the Commons
Vol. 11, no 1 2017, pp. 532–571
Publisher: Uopen Journals
URL:http://www.thecommonsjournal.org
DOI: 10.18352/ijc.750

ISSN: 1875-0281

Uniting forest and livelihood outcomes? Analyzing external actor interventions in sustainable livelihoods in a community forest management context

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Abstract: External actor interventions in community forest management (CFM) attempt to support communities with developing forest institutions and/or improving their livelihoods portfolio. Common pool resource (CPR) scholars

argue that forest institutions are required to prevent overharvesting of the forest resource stock (appropriation dilemma), and to encourage investment in its maintenance (provision dilemma). The sustainable livelihoods approach (SLA) has been widely used to analyse the influence of interventions on rural livelihoods portfolios. As interventions in CFM span the academic divide between CPR and SLA literatures, analysis of such interventions through *either* a CPR or SLA lens risks overlooking intervention activities, significant outcomes of the intervention, and the interplay between these outcomes. We propose here an analytical framework which combines CPR and SLA insights and ascertain its applicability by analysing interventions in a forest dependent community in Andhra Pradesh, India. We developed multiple indicators to measure the community's ability to deal with appropriation and provision dilemmas, and their livelihoods portfolio. Using data from forest plots, household questionnaires, focus group meetings and interviews, we analysed the intervention approaches, activities and outcomes. Our results show that a community's ability to deal with appropriation and provision dilemmas both affects, and is affected by its livelihoods portfolio. These intricate and dynamic interplays strongly influence the direct and indirect outcomes of intervention activities. Incorporating the synergy between the CPR and SLA perspectives in our analytical framework led us to a much more nuanced understanding of intervention approaches, activities and outcomes than would have otherwise been gained from a single perspective framework.

Keywords: Common pool resources, community forestry, India, interventions, rural development, sustainable livelihoods

Acknowledgements: We are extremely grateful to all the community members in East Godavari, Andhra Pradesh for sharing their experiences with us, logistical support and hospitality. We also greatly appreciate the time and patience shown by the external actors at the heart of this research whose honest responses to our questions enabled us to gain valuable insights into their daily work. We thank the reviewers for their thoughtful comments and suggestions.

1. Introduction

Forests represent dynamic spaces where (inter)national conservation goals and local level livelihood interests meet (Agrawal 2007) and often overlap with where the severe rural poor in developing countries live (Sunderlin et al. 2005). This makes for complex social-ecological systems (Persha et al. 2011) in which both governmental and non-governmental organisations attempt to intervene. Such external actor interventions in forest resources to both conserve biodiversity and provide livelihood benefits for forest dependent communities have proven difficult to design (Gibson et al. 2005; Bauch et al. 2014).

Encompassed in this complexity are the dynamics particular to forests used by multiple users, known as common pool resources (CPR). CPRs are resources that

produce rivalrous goods from which others cannot be easily excluded (Gardner et al. 1990). Hardin (1968) argued that as (i) the benefits of appropriation from a CPR are private, whilst the costs are shared, and (ii) the cost of provision of a functional commons are private, whilst the benefits are shared, overharvesting of and underinvestment in the resource stock – and ultimately a resource collapse – are unavoidable. This led him to advocate for either privatisation or nationalisation of the commons. Hardin's conceptualisation of the commons has been widely criticised for resting on the assumption that the commons are seen by its users as an open access system. Indeed, since the 1980s, Ostrom (1998) and colleagues have shown that resource users themselves can, under certain circumstances, create their own institutions so that commons are no longer seen as an open access system. Their research has provided evidence that these community-led institutions are sometimes able to deal with appropriation and provision (A&P) dilemmas to avoid resource collapse (Berge and Van Laerhoven 2011; Porter-Bolland et al. 2012). However, both Ostrom herself (Ostrom et al. 2007) and those who worked with her are keen to contend that community-led institutions offer no panacea for all commons (Schlager 2016). In a forest context, community-led forest institutions are commonly referred to as community forest management (CFM).

Research has shown that interventions in CFM aim at supporting communities with developing forest institutions (Barnes and Van Laerhoven 2015), and/or improving their livelihoods (e.g. trainings for self-help groups or providing market linkages) (Berkes 2007). The former intervention activities can be analysed through a CPR lens, though as yet, they have received little scholarly attention (Wright and Andersson 2013). The latter are commonly examined through the sustainable livelihoods approach (SLA), which has been influential in rural development thinking since the late 1990s (Chambers and Conway 1992: Scoones 2009). SLA presents an alternative to the single sector focus on production, employment and income as the sole concern of livelihood development (Scoones 2009). Livelihoods are seen as being comprised of two elements: the different *capitals* communities can access, and the *strategies* communities can employ to improve their livelihoods (Chambers and Conway 1992; Scoones 2009). An SLA lens has been widely used to study livelihood interventions in a forest setting, though without explicit attention for A&P dilemmas (Thin and Van Gardingen 2004; Ingram et al. 2015).

Interventions in CFM are being undertaken by a wide range of external actors, including government departments (at various levels) and civil society organisations (CSOs) such as non-governmental organisations (NGOs), activists and community based organisations (CBOs). As interventions in CFM span the academic divide between CPR and SLA literatures, analysis of such interventions through *either* a CPR or SLA lens risks overlooking intervention activities, significant outcomes of the intervention, and the interplay between these outcomes. For example, through a CPR lens an intervention could appear successful when a CSO has supported a community to craft rules to deal with A&P dilemmas as it is assumed that the rules will provide the incentives required for users to avoid

overharvesting and to invest in maintaining the resource. However, this would miss the changing incentives to overharvest which are derived from beyond the forest institution, for example, if the community were to simultaneously be gaining skills on sustainable harvesting of non-timber forest products (NTFPs) from another external actor intervention (i.e. a livelihoods activity). Similarly, through an SLA lens, an intervention could appear successful when training activities have led to improved access to knowledge of sustainable harvesting techniques, however this would miss whether this knowledge is supported by incentives provided by a forest institution (i.e. a CPR lens activity). Observed changes in A&P behaviour would therefore be put down to either forest institutions (through a CPR lens) or sustainable harvesting training (through an SLA lens).

An integrated framework that draws on both CPR and SLA literature to analyse intervention approaches, activities and outcomes in a CFM context would increase our ability to critically study interventions and subsequently could inform improved intervention designs. This has broader policy implications for both governmental and non-governmental actors, as an awareness of the interrelationships between A&P dilemmas and livelihood portfolios necessitates a move away from policies and programmes with a singular focus on one aspect of this complex and dynamic interrelationship. Subsequently, an integrated framework can provide useful input to reflections on whether appropriate intervention output and outcome indicators can be devised. We develop such an analytical framework and ascertain its applicability by analysing interventions in a forest dependent community in Andhra Pradesh, India. We aim to contribute to the broader scientific debate on the role of civil society in environmental governance (e.g. Bebbington et al. 2007; Edwards 2009; Banks et al. 2015), and in particular to their role in a CPR setting (Mansuri and Rao 2013; Wright and Andersson 2013).

Our analytical framework combines the two interrelated elements: a community's ability to deal with A&P dilemmas (CPR), and its livelihoods portfolio (SLA) in an overarching *outcome* variable, namely *sustainable livelihoods in a CPR context.* The intervention activities are seen as the *output* variables that could lead to changes in the outcome variables. The choice of activities (*output*) is determined by the external actor's motivation and approach to institutional change - here the *input* variable. Below, each variable in our framework – outcome, output, input – is discussed in turn.

The paper continues with a review of the literature discussing the *outcome* and *output* variables as discussed above. For each variable, the CPR and SLA literature contributions will be discussed separately and then combined to create our analytical framework. The following section outlines the methods used in order to ascertain the applicability of our framework for analysing interventions in a forest community in East Godavari, Andhra Pradesh, India. The results section then analyses the level of the *outcome* variable present and subsequently investigates the pathways through which the external actor interventions (*input* and *output* variables) have affected this *outcome* variable. The final sections reflect on the insights gained through employing our analytical framework for researchers

seeking to analyse interventions in such a complex setting, and for those designing such interventions.

2. Literature review

2.1. Analysing the outcome variable: sustainable livelihoods in a CPR context

2.1.1. Contributions from CPR literature: collective action in forest institutions to deal with A&P dilemmas

From a CPR lens, dealing with A&P dilemmas i.e. avoiding overharvesting and underinvestment of the CPR, requires collective action of the CPR users (Gardner et al. 1990; Dietz et al. 2003). Building on the design principles for robust forest institutions formulated by Ostrom (1990), CPR scholars have made great strides in understanding the factors which affect the likelihood of durable collective action emerging and being sustained (Agrawal 2014). Agrawal (2001) states that the likely number of factors will be between 30 and 40, categorised into four groups: resource system characteristics, group characteristics, institutional arrangements and external environment. The role of institutions, defined here following Ostrom (2005, 3) as 'the prescriptions that humans use to organise all forms of repetitive and structured interactions', has received particular attention from CPR scholars (Westermann et al. 2005; Pagdee et al. 2006; Agrawal 2007) as they are seen to reassure individuals that other forest users are equally investing in maintaining the resource stock, or refraining from overharvesting (Gibson et al. 2005). This is because institutions allow trust and norms of reciprocity to be built and sustained, which means collective action may become possible (Cox et al. 2010). Much discussion of the specific institutions, or rules, required has ensued, with Cox et al. (2010) reporting empirical evidence for the need for these A&P rules to conform to local conditions and to be congruent to each other, whilst Dietz et al. (2003) stress the need for the rules to evolve as the structure of A&P dilemmas changes.

2.1.2. Contributions from the Sustainable Livelihoods Approach (SLA): livelihoods portfolios

The SLA attempts to capture the 'complex and diverse realities of most rural life' (Chambers and Conway 1992, 4) with Oxfam, Cooperative for Assistance and Relief Everywhere (CARE) and the United Nations Development Programme being early proponents of the approach. *Sustainable* livelihoods are seen as a portfolio of capitals and strategies for a means of living which allows communities to recover from stresses and shocks, and maintain or enhance its capabilities and assets, while not undermining the natural resource base (adapted from Chambers and Conway 1992). This recognition by the SLA literature of the importance of communities' ability to bounce back from disturbances of course resonates well with more recent work on resilience and adaptive capacities (e.g. Olsson et al. 2004). Capitals are stocks of a resource which can be built up or depleted and can be unequally distributed (Bebbington and Perreault 1999) (Table 1).

Table 1: Livelihood capitals in a forest dependent community context.

Capital	Forest context explanation	Literature
Natural	Natural resources, stocks of timber and non-timber forest products (NTFPs)	Ingram et al. (2015), Sunderlin et al. (2005)
Human	Skills, education, knowledge, health and physical capabilities. Transferrable skills are a valuable capital.	Bebbington (1999)
Social	(1) family and kinship connections; (2) social networks or associational life related to groups or organizations; (3) cross-sectoral linkages, or networks of networks that link organizations of state, market, and civil society around problem-solving tasks; (4) political capital, the informal relationships and norms that link civil society and the state, and which determine levels of social control over the state; (5) the institutional and policy framework regulating public life; (6) social norms and values which influence societal functioning.	Bebbington and Perreault (1999)
Financial	Cash income from forests. Usually from private and common property resources.	Chhetri et al. (2012)
Physical	Locally appropriate infrastructure	Scoones (1998)

Scoones (2009) relays how the SLA has drawn on Sen's (1981) entitlements approach to emphasize the mediating role of institutions in defining access to these capitals and strategies. The types of institutions being referred to by SLA literature are socio-cultural and political processes. For example, gender institutions appear to influence access to social capitals (Westermann et al. 2005) and climate adaptation strategies (Mersha and Van Laerhoven 2016). We refer to the institutions discussed in the SLA literature as *community* institutions to distinguish them from the *forest* institutions discussed in the CPR literature.

The relationships between the capitals, such as substitution or clustering, serve as starting points for employing strategies, which are a 'complex bricolage of activities' (Scoones 2009). Whilst the SLA has developed a clear categorization of types of capitals (seen in Table 1), no classification of strategies is proposed, emphasizing instead the diversity of multiple activities conducted simultaneously to make a living. Bebbington (1999) argues that beyond such *instrumental action* (making a living), strategies can also comprise *hermeneutic action* (making living meaningful) and *emancipatory action* (challenging the structures under which one makes a living). In an NTFP context, Ingram et al. (2015) found strategies included cultivation, market based collective action and collective action to bolster bargaining position with NTFP buyers.

2.1.3. Interrelationships between CPR and SLA insights

The two outcome elements are interlinked in both directions i.e. the livelihoods portfolio influences the community's ability to deal with A&P dilemmas, and vice versa. We discuss these relations in turn.

The influence of the livelihoods portfolio on the ability to deal with A&P dilemmas
CPR scholars have individually pointed towards different factors, as well as forest institutions, that affect the structure of A&P dilemmas. For example, technical capacity and empowerment of forest users (Pretty and Ward 2001), community interests (Pagdee et al. 2006), local knowledge of the biophysical conditions and norms of other appropriators (Ostrom 1998) and social capital (Pretty and Ward 2001; Westermann et al. 2005) are shown to influence the ability to deal with A&P dilemmas. These individual studies each raised singular distinct factors affecting the ability to deal with A&P dilemmas, but these factors have not been collated into a single study in which their interrelationships can be explored.

As these factors all fall within the livelihoods portfolio as presented in the SLA literature, we argue that the SLA presents a useful organizing principle to systematically and holistically analyse the influence of livelihoods portfolios on a community's ability to deal with A&P dilemmas (see Table 2). Elements of the livelihoods portfolio can independently or collectively affect a community's ability to deal with A&P dilemmas as they alter the ratio of private benefits to shared costs (appropriation dilemma) or shared benefits to private costs (provision dilemma) and therefore the incentives to overharvest or underinvest. Integrating the bodies of literature in this way also plays into the current debate in SLA studies on what *sustainable* livelihoods entail (Scoones 2009). We pose here that, in a forest dependent community in a CPR context, the community's ability to deal with A&P dilemmas is an essential element of the sustainability of livelihoods.

The influence of a community's ability to deal with A&P dilemmas on its livelihoods portfolio
CPR scholars have shown that when communities are able to craft institutions to deal with A&P dilemmas, they can be successful in improving forest conditions and livelihoods (Ostrom 1990; Agrawal 2001; Pretty and Ward 2001). There appears to be consensus amongst CPR scholars on the broad categories of what can be defined as *successful CFM,* namely economic efficiency, social equity, and ecological sustainability (Agrawal 2001; Pagdee et al. 2006). However, such outcome variables are often vaguely formulated (Agrawal 2014) and few researchers systematically measure multiple indicators of performance under all three categories (Pagdee et al. 2006; Persha et al. 2011). Recent CPR literature critiques this single variable approach along two lines. Firstly, scholars point towards the potential for both trade-offs and synergies between human livelihoods and biodiversity outcomes (Pagdee et al. 2006; Persha et al. 2011). Secondly, scholars do not see successful CFM as an objective, steady end-goal, rather they highlight the different perspectives taken on the relevant outcome variables (Berkes 2007). Given its holistic and systematic approach to livelihoods, the SLA could go someway to addressing this critique.

The SLA has frequently been applied in a CFM context, with several authors discussing the influence of natural capital (mostly NTFPs) on other livelihood capitals, in different governance arrangements (Thin and Van Gardingen 2004;

Table 2: Possible influence of a community's livelihoods portfolio on its ability to deal with A&P dilemmas.

Livelihood component	Description of incentive provided	Influence of livelihood component on ability to deal with appropriation and provision dilemmas
Capitals		
Natural	• A high quality of forest resource stock relative to non-forest natural capital	A–, P+ (P– if perception of abundance is high relative to other natural capital stocks)
Human	• High level of community knowledge of specific sustainable harvesting techniques, general resource monitoring systems, or general education level	A+, P+
	• Knowledge of marketing techniques to add value to NTFPs	A–
	• Reliance on the forest for food (Porter-Bolland et al. 2012)	A–, P+
Social	• Bonding: high level of trust and reciprocity in the community and positive experiences working together in a committee	A+, P+
	• Bridging networks: connections increase access to other capitals - indirect effect on A&P dilemmas (Bebbington and Perreault 1999)	
Financial	• The CPR is a significant income source for all forest users (Mansuri and Rao 2013)	A–, P+
Physical	• Access to tools and transport to markets (Porter-Bolland et al. 2012 on markets)	A–
Strategies[a]		
Alternative livelihoods	• May relieve pressure on the resources. Less time available for maintenance	A+, P–
Migration/seasonal employment	• Relieves population pressure. Outmigration negatively affects social and human capitals (Agrawal 2001)	A+, P–
Value addition	• Could alter incentive to conserve and invest between species	Differs per species

[a]Most common strategies given here. Their specific nature will determine if they can be analyzed as instrumental, hermeneutic or emancipatory (Bebbington 1999).
Key: A= Ability to deal with the appropriation dilemma, P= Ability to deal with the provision dilemma, + = positive relationship, – = negative relationship

Ingram et al. 2015). However the influence of the community's ability to deal with A&P dilemmas on the capitals receives little attention. Indeed, Thin and Van Gardingen (2004) raise the need for further work to disaggregate the different contributions of forest CPRs on livelihoods. Incorporating CPR's attention for A&P dilemmas could contribute to this ongoing discussion. Table 3 presents the combined insights from CPR and SLA literature on how a community's ability to deal with A&P dilemmas could affect its livelihoods portfolio.

2.2. Output variable: exploring intervention activities

CPR scholars are aware that the traditional focus in CPR literature on community forestry *self-governance* has meant attention for external actor interventions and their outcomes has been limited, though we are starting to get an idea of *which* activities external actors potentially employ in their interventions, as discussed below (Wright and Andersson 2013; Barnes and Van Laerhoven 2015). In contrast, analysing livelihood interventions has been central to the SLA perspective (Scoones 2009). Combining CPR and SLA literature enables us to identify three different types of intervention activities. We explore literature on (i) *intervention activities directed at forest institutions (see 2.1.1)*, (ii) *activities aimed at directly affecting capital stocks and strategy choices (service provision) (see 2.1.2)*, and (iii) *activities focussed on strengthening or altering community institutions (see 2.1.2).* The differentiation between activities ii) and iii) mirrors a common thread in SLA literature (Bebbington et al. 2002) to distinguish between direct livelihoods provision and attention for the community institutions which mediate access to livelihoods. Each type of intervention activity is discussed in the following section and included in Figure 1: the integrated analytical framework, which follows.

The potential external actors undertaking these activities can be categorised in various ways. A distinction is often made between governmental and

Table 3: Possible influence of a community's ability to deal with A&P dilemmas on its livelihoods portfolio.

Influence of a community's ability to deal with A&P dilemmas on livelihood components	
Capital	
Natural	Positive. Pressure on other natural capital may also be relieved
Human	Improved subsistence use, enhanced sense of well-being
Social	Norms of trust and reciprocity could be improved and applied elsewhere, network improved as success cases attracts attention from outsiders
Financial	Could increase funds at a community level
Physical	Indirectly affected through financial capital
Strategies	
Alternative livelihoods	Transferable skills learned (e.g. bookkeeping)
Migration/seasonal employment	Alters incentive to engage in non-forest based strategies
Value addition	Alters ability and incentives for NTFP value addition strategies

non-governmental actors with further classification along characteristics such as size, location, funding body or objectives (Yaziji and Doh 2009). Government actors from various departments depending on the country context, may be formally tasked with specific activities (Blomley and Ramadhani 2006) e.g. setting up forest user committees (under type i) or agriculture extension work (type ii). Likewise larger NGOs may receive funding for particular activities e.g. women's empowerment (type iii) whereas smaller CBOs may work more flexibly depending on personal preference or apparent needs. However, we avoid presuming activity choices are based on such classifications, as many scholars have noted the fuzzy boundaries between governmental and non-governmental actors (Brass 2016), interactions between actor types (Lemos and Agrawal 2006), deviation of intervention practices from formal objectives (Mosse 2004) and indeed the plurality of activities that can be undertaken simultaneously (Chhotray 2007). Therefore we view the motivation for each external actor's activities as a focus of empirical analysis (Section 2.3) rather than being derived from a classification scheme.

2.2.1. Activities directed at forest institutions

Barnes and Van Laerhoven (2015) found that NGOs did not involve themselves in *functioning* collective action [characterised by Poteete and Ostrom (2004) as (i) regular meetings, (ii) the presence of rules on entry, harvesting and monitoring, and; (iii) the presence of a system to enforce the rules] but they did conduct a wide range of activities directed at stimulating *durable* collective action to develop forest institutions [characterized by Barnes and Van Laerhoven (2013) as knowledgeable actors that have management and communication skills, plus sufficient material and financial resources]. These activities include informing of government policies, discussing institutional aspects and arranging exposure visits. Categorised, these activities cover development of community capacities and relations with external institutions. Pretty and Ward (2001) found external actors also conduct participatory processes to form forest user associations that are expected to craft forest use rules. Such forest institution building activities could be combined with other technical knowledge provision in order to provide both short and long term incentives for communities (Thin and Van Gardingen 2004).

2.2.2. Activities directed at service provision

Service provision interventions can focus on providing knowledge, technology, resources, or transportation to boost a capital (or suite of capitals) or livelihood strategy (Berkes 2007). For example, Bebbington and Perreault (1999) discovered that through injections of technology and money, government actor interventions in Ecuador have also helped build social capital alongside physical and financial capitals. Bridging social capital can be fortified by service providers both deliberately, through exposure visits and inadvertently, through inherent relationship building when providing other services.

2.2.3. Activities directed at community institutions

Interventions should help reconfigure institutions mediating access to resources (Allison and Ellis 2001), or as Edwards (1999, 372) argues, 'do not sacrifice the slow and messy process of institutional development for quick material results; the results will come – and will last – if the institutional fabric supports them'. As discussed in 2.1.2, without addressing the institutional arrangements that are at the root of inequality, interventions could continue to have a differentiated effect [for example along gender lines, as shown by Mersha and Van Laerhoven (2016)]. Therefore, many scholars have argued that attention to institutions could help to avoid skewed participation in service provision activities and that as such the benefits of participation would be more widely spread and sustained (Mansuri and Rao 2013; Ingram et al. 2015). Greater attention for institutional reconfiguration support could allow marginalised individuals to access other capitals (Bebbington and Perreault 1999), which ultimately means interventions could be more effective and efficient (Scoones 1998; Edwards 1999). Effecting such institutional change requires a long-term, multipronged approach (Hulme 2000; Westermann et al. 2005; Berkes 2007). Combining attention for service provision and institutions from the start of the intervention is seen as favourable (Thin and van Gardener 2004).

2.3. Inputs to interventions: motivation and approach to institutional change

2.3.1. Motivation

We include external actors' motivation to work in a particular way with communities as being the *input* to the actual activities they conduct – the *output*. As outlined in 2.2, we argue for empirically analysing external actor motivation rather than deriving it from a static classification of actor type, size, location etc. Various factors can influence external actor motivation. For both governmental and non-governmental actors, real or perceived demand from donors for demonstrating impact on poverty encourages actors to focus on what Bebbington (2005, 945) terms, 'production-oriented interventions' with restricted target groups as opposed to institutions. Efforts may be directed at the specific activities that are more likely to receive funding (ibid) and for which tangible outputs can be measured and communicated (Wright and Andersson 2013). Organisational expertise and culture affects activities of non-governmental actors (Bebbington 2005) and similarly, Fleischman (2014) found forester values and institutionalised incentives to influence the behaviour of forest department officials. Perceived division of responsibilities between an external actor and community (Barnes and Van Laerhoven 2015) also play a role in which activities are seen as the 'normal' way of working.

2.3.2. Approach to institutional change

The approach to working with institutions can vary. In Barnes and Van Laerhoven (2015) a typology of approaches to institutional change is proposed based on

interventions in forest institutions. We expand this typology to include interventions in community institutions as discussed in the SLA literature (see 2.1.2). In order to exert influence on institutions, external actors could focus on the rules determining structure (institutional design), or on the agency of individuals to effect change (institutional crafting). Approaches could also differ according to whether the institutional change is led by the external actor (objective) or the community itself (subjective). Examples of the resulting four archetypical and dynamic approaches are shown in Table 4.

The building blocks and interlinkages in our analytical framework are visualised in Figure 1.

3. Ascertaining the applicability of the analytical framework

3.1. Introduction to the case

We chose to focus on an area of India with a high scheduled tribe (ST) population for two reasons. Firstly, STs live predominantly in areas of high rural poverty and severe deforestation [49.6% of STs are living below the poverty line, compared to 12% of the total population (Ministry of Tribal Affairs 2014)] therefore the need to analyze interventions is such communities is great. Secondly, the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (hereafter FRA) is currently being implemented across many states which provides forest dwellers with a legal process for recognition of individual and community rights to forest land and resources. The scale of the tenure transition it elicits provides a significant opportunity for external actors to intervene in tribal communities. The East Godavari district of Andhra Pradesh was chosen as

Table 4: Archetypical approaches to institutional change.

Approach to institutional change	Description	Examples of application	
		Forest institution (CPR)	Community institutions (SLA)
Objective institutional design	Generic approach driven by external actor and applied to create rules	Forest use rules determined by external actor	Quotas for minorities to participate in committees/ trainings set by external actor
Objective institutional crafting	Generic approach driven by external actor and applied to empower forest users	Application of participatory appraisal techniques with a focus on forest use	Application of participatory appraisal techniques to develop interest areas of minority groups/ change status quo institutions
Subjective institutional design	Community engages in reflective dialogue process promoted by external actor to discuss rules	Facilitation of discussions on forest rules	Facilitation of discussions on committee/ training minority participation rules
Subjective institutional crafting	Community engages in reflective dialogue process promoted by external actor to empower forest users	Exposure visits to successful forest dependent communities	Discussions and support of minority groups according to their interests (e.g. women self-help groups)

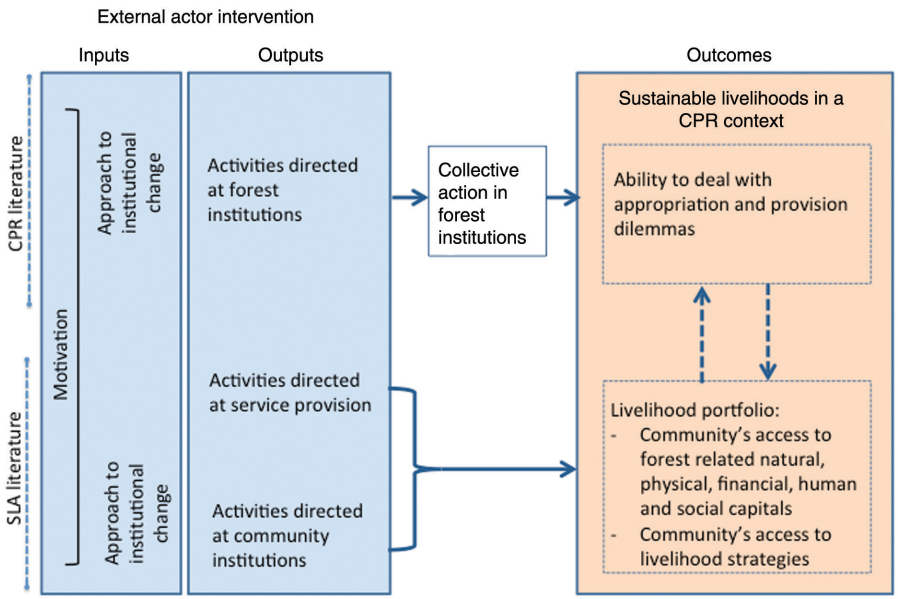

Figure 1: Integrated analytical framework.

forest dependent tribal communities comprise 75% of the population, and there is a high rate of deforestation (Ministry of Tribal Affairs 2014). We selected a tribal community as our intervention case and compared this to a nearby control case. The intervention case was chosen for two reasons. Firstly, the community had recently received community forest resource rights (CFR) under FRA which legally allows them to protect and manage their customary forests. It is therefore interesting and pertinent to analyse interventions in this context. Secondly, two different external actors were present, with potential for diverse intervention approaches: i) a small community based organisation (CBO) that had been working on tribal development in the area for 30 years, and ii) a Prime Minister's Rural Development Fellow (PMRDF) on a two-year contract with the governmental Integrated Tribal Development Agency (ITDA). They shared the broad objective of advancing tribal development. We recognized that in order to observe outcomes of the intervention and pathways of change in isolation, it was necessary to investigate a community with significant and longstanding external actor activity. The control case had not received any external actor interventions and the biophysical, socioeconomic and institutional differences between the intervention and control cases were kept to a minimum (Appendix 1).

Following Gerring (2007) we chose a pathway case study method as it can help to 'elucidate causal mechanisms' (Gerring 2007, 238) between the interventions and our outcome variable. This method can be employed after an initial cross case (intervention-control) comparison has revealed differences in

outcome variables which are hypothesised to be due to the activities employed in the interventions. The pathway case study method involves tracing the effects of the interventions and thus exposing the steps between interventions and outcome variables.

Due to the exploratory nature of our research, we take *the community* as our unit of analysis, whilst recognising that this will not reveal the range in both outcome elements within communities due to heterogeneous population characteristics (e.g. caste, gender etc.) (Kashwan and Lobo 2014). The community is delineated by location (village) as it is along these lines that people organise for festivals, roof repairs etc. As such, the terms community and village/ villagers are used interchangeably.

3.2. Variable operationalization

The indicators used for all variables in our framework are outlined here and the full justification for indicator selection and scoring can be found in Appendix 2. We selected indicators for the ability to deal with the appropriation dilemma that reflect the degree of overharvesting, namely: changes in the distance to harvest NTFPs and their quality over the past 5 years. Through initial discussions with local experts, this was determined to be the maximum period that could be reliably recalled by respondents. We measure the ability to deal with the provision dilemma through data on the community's investment in both the forest stock and the monitoring of the forest.

Livelihoods portfolio indicators were selected from SLA literature based on their relevance to the tribal forest-dependent community context and with the aim of comprehensively covering each capital or strategy. We selected four indicators per capital and developed context specific descriptions of a high, medium and low level of access to each capital, attaching scores of 3, 2 or 1 respectively. This results in a maximum score of 12 per capital. Given the qualitative nature of most indicators it was not possible to develop a more fine-grained scale. Our motivation for the indicator selection and scores is given in Appendix 2. The livelihood strategies were analysed as instrumental, hermeneutic or emancipatory as discussed under 2.1.2.

Data on intervention activities (output) directed at forest institutions were analysed using a selection of the most commonly influenced manipulable indicators of collective action taken from Barnes and Van Laerhoven (2015). The indicators cover resource characteristics, functioning collective action (e.g. meetings, rules in place) and durable collective action (e.g. awareness of rules, perceived management capacities). We also drew from Barnes and Van Laerhoven (2015) to classify approaches to institutional change (input).

We endeavoured to choose locally appropriate indicators for each variable, and are aware that the results are highly dependent on the choice of indicators and data availability. We use the empirical data to analyse the applicability of our framework and not to gain generalizable conclusions.

3.3. Data collection

Data were collected at community level during January through March 2015. Following the indicators given in Appendix 2, outcome data were collected from a household questionnaire of twenty five percent of the total number of households in each community (following Angelsen et al. 2011), focus group discussions with villagers (see Appendix 3), forest plots and published documents and maps from the ITDA and Forest Department (FD). Respondents for the household questionnaire were purposefully selected to ensure equal clan representation. A local interpreter with formal training in social science methods assisted with questions formulation and implemented the questionnaire in the field. This ensured construct validity of the questions posed and reliability of the method employed. Focus group discussions were executed to introduce the research team and the purpose of the research, to ascertain information about NTFP seasonality, forest boundaries and physical capital (see Appendix 3). The natural capital data were collected from ten forest plots per case. This number of cases was seen as the minimum necessary to sample over the range of variability in field conditions, given the available time to collect data in the field. To collect the output and input data in our intervention case we conducted three semi-structured interviews of at least 45 minutes each and many informal discussions over the three month period with the external actors, conducted four semi-structured interviews with local experts (ITDA and FD identified through snowballing), observed intervention activities and discussed interventions with community members during four focus group discussions to corroborate our findings.

4. Results

4.1. Outcome variable

4.1.1. Ability to deal with A&P dilemmas

Overharvesting appears to be prevalent as shown by the increasing distance most people travel to harvest NTFPs and to a lesser extent, as seen in the decreased quality of NTFPs harvested over the past 5 years (Table 5). All community members collect NTFPs and this is mostly undertaken as a group, as frequently as

Table 5: Ability to deal with A&P dilemmas.

Indicators		Intervention	Control
Appropriation (% respondents agreeing)	Distance to harvest NTFPs has increased over past 5 years	78	85
	Quality of NTFPs harvested has decreased over past 5 years	56	73
Provision	Evidence of stock maintenance	Mounding of bamboo	
	Active community monitoring	Limited to youth standing at strategic locations around border of designated bamboo area. This is done on a voluntary basis. Trench has been dug to hinder outsiders.	

required, with strong gender norms determining the particular NTFPs to be collected. In both communities, the limited efforts to maintain the resource stock or invest in community monitoring (beyond hindering outsiders) is evident. The intervention case does display some community efforts to maintain the bamboo stock in designated bamboo areas only. However the community monitoring does not extend to internal monitoring of harvesting, or to areas not specifically designated for bamboo harvesting. The forest institution hypothesised to influence the appropriation and provision behaviour is outlined later under 4.2.1.

4.1.2. Livelihoods portfolio

Both communities have a fairly consistent level of access to each capital in their portfolio (Figure 2). The intervention case scores better than the control case apart from for natural capital, where both cases only score slightly over half the maximum available points. See Section 4.2.2 for the scores per indicator.

Households in both the intervention and control cases rely heavily on the same *instrumental livelihood strategies* of farming and daily wage labour, though the proportions engaged in each strategy differ across the cases (see Appendix 4). The community in the intervention case held a bamboo auction, which is both an economically significant *instrumental* strategy and simultaneously a *hermeneutic* strategy. This is seen by the pride with which respondents in the focus groups spoke of it. Only the intervention community engaged in any *emancipatory* livelihood strategies through applying for legal community forest resources (CFR) rights under the Forest Rights Act (FRA, formally called The Scheduled Tribes and Other Traditional Forest Dwellers Act 2006). Pre FRA, bamboo sales were controlled by the FD therefore both claiming CFR rights under FRA and organising the bamboo auction represent an important step towards altering local power structures in their favour.

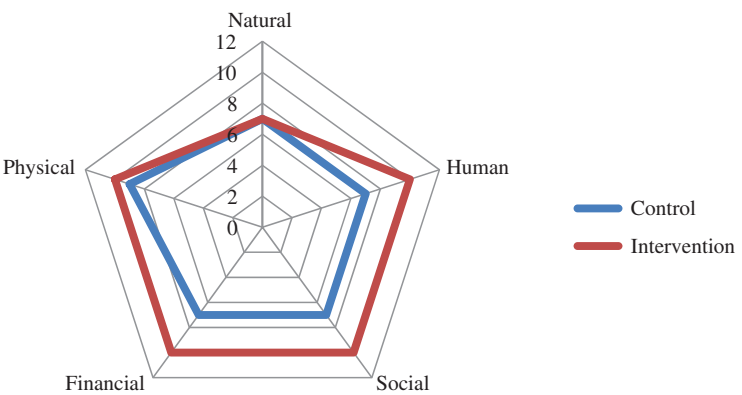

Figure 2: Total capital scores for the intervention and control cases.

In summary, both communities appear to be struggling with A&P dilemmas though the intervention community is doing slightly better. We see a markedly better livelihoods portfolio in the intervention community, except for access to natural capital.

4.2. Outputs: activity types

In the following Tables (6, 7 and 8) we show the activities undertaken by the external actors in the intervention community. The ITDA focussed on the forest user committee, which was set up following recognition of the CFR rights under FRA. The CBO worked both with the committee and the rest of the community. The external actors did not coordinate activities, a point returned to in the discussion (5.2).

4.2.1. Activities directed at forest institutions

None of the indicators of collective action were present in the control case. In the intervention case, the external actors conducted activities to influence both

Table 6: Activities directed at forest institutions in the intervention case.

Manipulable indicators of collective action	Status	Influence of intervention activity
Well-defined boundaries of the resource	Present	Already clear for communities. Legally formalised under FRA by ITDA.
Frequent meetings	Meetings are held weekly, or as called by the chair, if a problem arises, or an external actor visits. 1/3 of villagers on average attend meetings	Suggested by CBO
A&P rules-in-use present	Limited in scope to only one NTFP: bamboo. Outsiders excluded.	CBO discussed forest rules Both focussed on bamboo.
Locally devised rules	Committee established rules	CBO discussed forest institution decision-making processes and promoted consensus decision-making
Graduated sanctions for rule infractions	On case by case basis	
Accountability of monitoring system	Informally to committee	
Understanding policies	Chair of committee has some understanding of FRA. Others know only by name.	Introduced by both external actors
Confidence in allocation of benefits	Limited to bamboo	ITDA discussed
Awareness of rules high	Discussed at meetings	CBO involvement limited to initial discussions
Perceived management capacity	Strong leader. Expect support from ITDA with next bamboo auction.	Leader promoted by both external actors. Dependency relationship created by ITDA.

the need for the forest (e.g. technical training on bamboo harvesting), and how such decisions are taken (e.g. promoting consensus decision-making) as shown in Table 6. The CBO led discussions on decision-making eventually resulted in a forest committee being formed in 2014. The ITDA formalised the committee through discussing roles and registering it under FRA. The committee consists of 10 members, 3 women and 7 men, who were elected on the basis of their ability to communicate. Each clan has a representative. There was no external actor influence on the monitoring or sanctioning rules. Their focus on bamboo is clearly reflected in the content of the rules in place, which do not extend to other NTFPs.

4.2.2. Activities directed at service provision and community institutions

Tables 7 and 8 show the intervention activities that affect the indicators for each capital and the livelihood strategies, respectfully. Where attention was paid to community institutions in the intervention activity, this has been indicated with an asterisk (see key).

Our analysis reveals that the activities of both external agents are mainly directed at improving access to human and financial capitals. Imparting knowledge of sustainable harvesting techniques or marketing of NTFPs (human capital) is expected to enable or encourage communities to reduce overharvesting and engage in maintaining the forest stock, whilst also increasing the financial potential of their forest resources. The ITDA's intervention in livelihood strategies has a strong financial component. Support in gaining CFR rights under the FRA was undertaken with the goal of arranging the bamboo auction. It is striking that the external actors' efforts were not aimed directly at improving the natural capital, nor did they get involved in the social fabric of the community.

Institutional attention was mostly limited to institutional sensitivity in the design of some of the human capital trainings – e.g. in selecting women, or in holding meetings at convenient times for all the community to encourage participation. The ITDA's intervention activities showed less attention for institutions than those of the CBO. We see little evidence from either external actor of reinforcing trainings at later dates, attempting to make the knowledge stick within existing institutions or efforts to reconfigure institutions (beyond selecting women for one off trainings or visits).

4.3. Input

4.3.1. Motivations

Both external actors claim to work towards the holistic development of the local forest communities. Environmental goals are not of primary concern. The CBO's local understanding and involvement was seen to motivate, and legitimise its work. The intervention case was selected as the CBO secretary had contacts in the community, there is an abundance of bamboo and it is easily accessible. The ITDA's two-year contract creates an incentive to select working areas with potential to achieve fast, tangible results which includes areas in which other external actors

Table 7: Activities directed at livelihood capitals.

Indicator for each capital	Scores		Intervention activities (external actors: CBO, ITDA, both)
	Intervention	Control	
Natural capital			
Species richness	2	2	Indirectly through trainings provided,
Cut damaged stock	2[a]	1	including sustainable bamboo harvesting
Grazing damaged stock	2	2	(see human capital)*
Fire damaged stock	1	2	
Total	7	7	
Human capital			
Stated sustainability of harvesting NTFPs	3	1	Organised biodiversity awareness meetings, provided training and booklets on bamboo harvesting*
Awareness of FRA	3	1	Discussed FRA with community on several occasions**
Personal consumption and medicinal use of NTFPs	3	3	
Knowledge of management and marketing of NTFPs	1	2	Provided value addition training and trained volunteers to help with value addition trainings***
Total	10	7	
Social			
Level of conflict	3	2	
Bonding: shared cultural events	3	3	
Experience of formal committees	2	1	
Bridging: connections with key external stakeholders	2	1	Exposure visits ****, invited village leaders to state level FRA consultations****
Total	10	7	
Financial			
NTFPs with financial potential	3	3	Provided packaging for value added products, support with marketing products*, indirectly through value addition trainings (see human capital)*** *Legal access a result of the ITDA's influence on the claiming of CFR rights under FRA*
Number of months of employment provided by collecting NTFPs	2	1	
Employment from government schemes	2	2	
Community fund from forest activities	3	1	*Set up community investment bank account*
Total	10	7	
Physical			
Transport availability	3	3	
Infrastructure	2	1	*Financial support for tap system*
Shelter	3	3	
Forest (produce) tools	2	2	Distributed agriculture implements
Total	10	9	

[a]A high level of stock damage (through cutting, grazing, or fire) means a low score for the relevant indicator.

Table 8: Activities directed at livelihood strategies.

Livelihood strategies	Intervention activities (external actors: CBO, *ITDA*)
Instrumental: Processing and selling NTFPs	Arranged one off sale in Delhi of mahua flower cakes***
	Arranged bamboo auction
Hermeneutic: Expanding skills	*Arranged bamboo auction*
Emancipatory: Gaining legal entitlement to land	Initiated discussion on applying for rights under FRA****
	Arranged bamboo auction, drove the CFR claim under FRA, provided training to volunteers to promote FRA

Key to institutional approach (for both Tables 7 and 8)
*Created opportunity for all villagers to participate
**Attempted to involve all villagers by discussing on multiple occasions
***Selected women
****Selected leaders

are already working. The passing of FRA legislation in 2006 introduced potential tenure security for forest dependent dwellers and thereby bamboo gained financial value for the community. This change in the institutional setting appears to have influenced both external actors' choice of activities.

4.3.2. Approach to institutions

Figure 3 shows the external actors' approaches to both forest institutions and communities institutions.

We observe that both external actors engage throughout the intervention using three different approaches to institutional change. The most common approach is *subjective crafting* whereby human and social capitals and forest institutions are developed through facilitated community dialogue. An *objective crafting* approach was mostly chosen when community liaising with parties beyond the village boundary was required. Noticeably, *subjective* approaches are taken to developing human capital though such an approach will also indirectly support the development of social capital as groups congregate to discuss developments in their community. The ITDA took an *objective* approach to influencing livelihoods strategies seen as they clearly drove the process of claiming CFR rights under the FRA and arranging the bamboo auction.

5. Discussion

5.1. Outcome variable

Our analysis indicates the intricate and dynamic relationships between the two outcome elements: a community's ability to deal with A&P dilemmas, and their livelihoods portfolio. Mutual and circular processes of influence are at play (Figure 4).

The intervention community displays a lower level of both internal and external conflict and more extensive and positive experiences with working in formal

Subjective design	Subjective crafting
- Actively discussing forest rules	- Actively discussing forest institution decision-making processes - Discussing FRA claims process - Support in marketing local products - *Discussing FRA claims process* - *Taking leaders to state level FRA consultations*
Objective design	**Objective crafting**
- Mapping resource ownership boundary - *Providing training on FRA claim process* - *Driving FRA claims process (including formalizing FRA committee)* - Value addition training	- Promoting consensus decision-making in forest institution - Supporting communities in liaising with officials - *One off sale of produce in Delhi* - *Organizing bamboo auction*

Key:

Actor: CBO, *ITDA*

Text colour- main outcome component being influenced: the Forest institution; Human, Social capitals; Livelihood strategies. Underline colour- secondary capital being influenced

Figure 3: Approach to institutions.

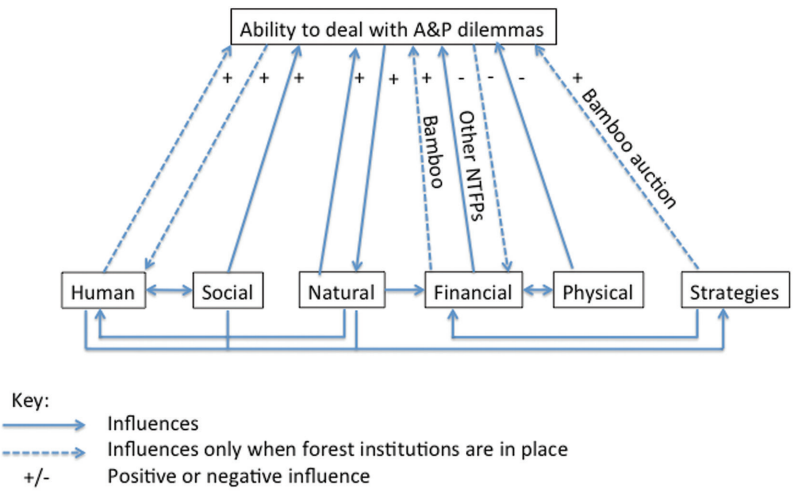

Figure 4: Outcome variable: Interrelations between the community's ability to deal with A&P dilemmas and their livelihoods portfolio.

committees (*social capital*), and generally shows knowledge of how to harvest NTFPs sustainably (*human capital*), which we would expect to have a positive influence on their ability to deal with A&P dilemmas. However, the *natural capital* shows signs of overuse and damage from unsustainable practices, there is evidence of a poor ability to deal with the *appropriation* dilemma and evidence of mounding as a means to improve the bamboo stock (*provision*) is only found in areas designated to bamboo growth. *What could explain this pattern?* As our analysis of the forest institution shows an absence of operational rules, beyond the limited rules applicable to the designated bamboo area, this leads us to argue that knowledge of sustainable harvesting techniques (even in the presence of high levels of social capital) needs to be supported by functioning operational forest use rules in order for the community to deal with A&P dilemmas. Strikingly, even in the intervention case where high levels of social and human capitals are found, this has not resulted in extensive forest institutions for NTFPs other than limited rules within the bamboo-designated area.

Both communities display high levels of harvesting NTFPs for subsistence use (*human capital*) and commercial use (*financial capital*), household agricultural land is limited and non-forest employment through government schemes though valued, is unreliable. Therefore it appears both communities are highly reliant on the forest for subsistence and commercial purposes. Strikingly, this has not led to a high level of ability to deal with A&P dilemmas in both communities. *Why is this the case?* The low levels of knowledge of management and marketing of NTFPs (*human capital*), which limits market access, even though transport is available (*physical capital*), could be one explanation. However this does not explain why the intervention community has a greater ability to deal with A&P dilemmas of bamboo specifically, at least within the designated bamboo area. An alternative explanation can again be found in the presence of a forest institution for bamboo in which provision rules, limited appropriation rules, and benefit-sharing rules are evident, compared to the lack of rules for other NTFPs.

5.2. The role of the interventions: linking input and output variables with the outcome variable

A complex, dynamic picture emerges with interventions influencing both elements of our outcome variable. Figure 4 shows how intervention activities initially aimed at one particular component of our outcome variable, can indirectly influence other components, which may themselves be the subject of parallel activities (not necessarily by the same external actor). We illustrate this point by referring to the activities that ultimately led to a successful bamboo auction. The lower level of conflict in the intervention community compared to the control case can at least partly be attributed to the CBO's long-term presence and work on consensus decision-making. This allowed the ITDA to push for the recognition of CFR rights under FRA, to organise the bamboo auction (*strategy*) and to discuss equity in benefit sharing. This resulted in financial benefits of 36,111

rupees per household (compare to the World Bank global poverty line of 130 rupees per day) and 1,300,000 rupees for the community fund, which was partly used for installing a solar powered tap system (*physical capital*). Parallel to this, the CBO was discussing sustainable bamboo harvesting techniques and rules with the community. As we have seen above, forest institutions play a central role as a mediating factor between human capital (knowledge of sustainable harvesting) and natural capital. Therefore it appears the CBO's facilitation of discussions on bamboo rules was an essential element in determining the degree of livelihood benefits that ultimately flowed from the bamboo auction organised by the ITDA.

The motivation and institutional approach (*input*) appear to be influential in determining the scale of impact of interventions on the outcome variable, and whether this is likely to be sustained over time. It appears that the *objective crafting* approach taken by the ITDA in organising the bamboo auction reduces its potential longer-term impact as it did not translate into increased skills in the management and marketing of NTFPs in the intervention community. This makes it less likely that the community can independently hold future bamboo auctions, or distribute benefits equitably. It could however be argued that this approach, motivated by a short contract, was needed given the strong resistance from local FD officials to holding the auction. The CBO's motivation to focus on bamboo in discussions on sustainable harvesting and operational rules, was explained as a way of gaining community interest before moving on to discussions on other NTFPs. Incremental interventions in which trust is built over a longer period are generally encouraged in recent development literature (Westermann et al. 2005; Ramalingam 2013). However the danger here is that attention for the short-term significant financial gains from bamboo could negatively affect incentives to manage other NTFPs for subsistence use. This is likely amplified in this case by the ITDA's focus on the bamboo auction, thus exemplifying how the motivation and institutional approach taken by one external actor has repercussions for other interventions.

Employing the pathway case study method and comparison to the control case allows us to argue that the intervention's input and output variables have clearly influenced the outcome variable in multiple ways. However, each community is unique and may respond differently to external actor interventions (De Koning 2014) and such differences cannot be controlled for completely. We did not observe any exogenous factors to affect our outcome variables disparately across the cases, indeed the similar levels of natural capital across the cases reassures us that neither case is facing greater external pressures to the forest.

5.3. Reflections on the framework

Our premise to this paper was that external actor interventions in CFM and their diverse outcomes are being inadequately evaluated by using analytical frameworks solely originating in either CPR or SLA literature. An approach purely based on the Institutional Analysis and Development (IAD) framework for example (see McGinnis 2011) would have offered us too little manoeuvring space regarding

the analysis of (i) external actor interventions in local level forest institutions and livelihoods e.g. trainings, and (ii) interrelationships between institutions within the same locality. The added scientific and practical value of our combined framework can be ascertained by asking ourselves what we would have missed had we analysed the intervention through only a CPR or SLA lens.

From a CPR perspective, we would have overlooked how the livelihoods portfolio influences the community's ability to deal with A&P dilemmas over time. Attention to the specific combination of capitals and strategies in the livelihoods portfolio helps CPR scholars explain why some rules made in a forest institution are being adhered to, whilst others have not led to a better ability to deal with A&P dilemmas. In this case, applying the SLA lens revealed how the improved knowledge of sustainable bamboo harvesting and support with the bamboo auction, combined with the presence of (limited) bamboo use rules, in creating an increased incentive to deal with bamboo specific A&P dilemmas. CPR literature also does not facilitate a nuanced interpretation of the livelihood consequences of a community's ability to deal with A&P dilemmas. SLA insights here allowed us to gain a more detailed picture of the high levels of subsistence and commercial reliance on the forests indicating the far-reaching effects a poor ability to deal with A&P dilemmas could have.

From a pure SLA lens we would have missed the specific A&P dilemma dynamics and (lack of) incentives provided by the forest institution in an analysis of the livelihoods portfolio. The immature nature of the forest institution helps explain why A&P dilemmas are prevalent and therefore appears to form a mediating variable between the sustainable harvesting knowledge (human capital) and the natural capital stock indicators. An SLA lens may also have missed the role forest institutions and A&P dilemmas appear to play in understanding the *sustainability* of livelihoods. By including these notions from CPR literature, livelihood analyses gain a tool for predicting how the livelihoods profile could develop in the future. This feeds into Campbell et al. (2001)'s concept of lowest permissible limits per capital, beyond which a capital bottleneck limits sustainable livelihood achievements.

We don't presume to be able to draw generalizable conclusions from the specific relationships between outcome elements found in our case study, especially given the low number of cases analysed and limited number of indicators for each livelihood component and the A&P dilemmas. Two characteristics are especially relevant to discussions on the generalizability of findings: the selection of cases from a tribal area and the Naxalite presence nearby. Firstly, interventions in non-tribal communities may differ significantly as greater heterogeneity along various lines (e.g. caste, livelihood options, connections beyond the community) would affect the community's livelihood portfolio and approaches taken by external actors. Secondly, though there was no Naxalite presence in the area (at mandal/taluk level) during the fieldwork period, on-going tensions would negatively affect the breadth of livelihood options available, relations with officials and could explain the lack of interventions. However, we can expect to see the same general pattern of intervention activities affecting multiple, interrelated outcome variables, replicated elsewhere, though each intervention and community is in itself unique.

6. Conclusions

Civil society organisations across all scales are grappling with understanding which interventions create the most impact in CFM (e.g. IUCN 2012; FAO 2014). By converging two bodies of literature that generally inform, or at least inspire, scientific evaluations of such interventions, we hope to have created an integrated analytical framework that can contribute towards this endeavour.

So what lessons can we draw for analysing CFM interventions? We contribute to CPR scholars' endeavours to look beyond the forest institution in understanding interventions and A&P dilemmas (e.g. Baur et al. 2014; Van Laerhoven and Barnes 2014) and suggest SLA scholars pay attention to a community's ability to deal with A&P dilemmas in analysing the *sustainability* of livelihoods in a CPR context. However, our main message is that we need to look beyond the separate perspectives when analysing interventions in CFM, and most likely in other CPR contexts. The synergy between the CPR and SLA perspectives led us to a much more nuanced understanding of the intricate and dynamic interplays between intervention approaches, activities and outcomes than would have otherwise been gained from a single perspective framework. Further applications of the framework in a variety of CPR settings are required, in which context specific indicators for livelihoods portfolios are created and differentiated livelihoods within communities are explored (Agarwal 2000). The influence of external actors' overlapping spaces (Berkes 2007) on the impact of interventions also requires further attention. Flexible longitudinal research designs that encompass changes, such as new livelihood opportunities (Campbell et al. 2001) would help in analysing how the interrelated outcome elements alter over time. Differentiating NTFP specific A&P dilemmas would help us understand how the changing economic potential of one NTFP can affect the A&P of other NTFPs. Related to this, the FRA paves the way for communities to potentially profit economically from certain NTFPs, and therefore we may see external actor interventions responding accordingly. This raises pertinent questions regarding the powerful position such actors hold vis-à-vis communities. Incorporating such power dynamics into our framework of approaches to institutional change would be a worthy consideration. Kashwan (2016) observes that the role that intra-community power differences play in explaining higher than expected levels of cooperation – and hence, in the solving of A&P dilemmas – constitutes an important puzzle in institutional analysis. We second that, and would add that the same goes for the role of power asymmetries in the relation between communities and external actors. Another aspect deserving attention for the further development of our approach regards how external actors' attempts to strengthen livelihood portfolios and increase communities' ability to deal with A&P dilemmas, specifically adds to their resilience and adaptive capacity in a given context.

For those designing CFM interventions, our results indicate that external actors should be aware of the interrelations between A&P dilemmas and livelihoods portfolios, and therefore the potential effects of their efforts beyond their initial objectives. Such interventions will need to adapt as communities' goals, institutions and

livelihoods portfolios change over time (Dietz et al. 2003) and when other external actors appear on the scene. The inherent dynamic uncertainty of such a complex CFM setting cannot be designed away in favour of simple linear activity-outcome interventions. Adaptive Management principles could be drawn on here to offer broad guidelines for interventions. The main steps of design; act; monitor and observe; and reflect and revise, (Rist et al. 2013) including continuous dialogue with communities throughout (Campbell et al. 2001), create opportunities for social learning – for both the external actors and community (Stringer et al. 2006) and goal revision. Such a *subjective* approach is more likely to support both community institutions (Edwards 1999) and forest institutions (Agrawal 2014) increasing the chances that communities can independently self-reflect and adapt institutions as both livelihood profiles and the nature of A&P dilemmas change over time.

Literature cited

Agarwal, B. 2000. Conceptualising Environmental Collective Action: Why Gender Matters. *Cambridge Journal of Economics* 24(3):283–310. https://doi.org/10.1093/cje/24.3.283.

Agrawal, A. 2001. Common Property Institutions and Sustainable Governance of Resources. *World Development* 29(10):1649–1672. https://doi.org/10.1016/S0305-750X(01)00063-8.

Agrawal, A. 2007. Forests, Governance and Sustainability: Common Property Theory and Its Contributions. *International Journal of the Commons* 1(1):111–136. https://doi.org/10.18352/ijc.10.

Agrawal, A. 2014. Studying the Commons, Governing Common-Pool Resource Outcomes: Some Concluding Thoughts. *Environmental Science & Policy* 36:86–91. https://doi.org/10.1016/j.envsci.2013.08.012.

Allison, E. H. and F. Ellis. 2001. The Livelihoods Approach and Management of Small-Scale Fisheries. *Marine Policy* 25:377–388. https://doi.org/10.1016/S0308-597X(01)00023-9.

Angelsen, A., H. O. Larsen, J. F. Lund, C. Smith-Hall, and S. Wunder. 2011. *Measuring Livelihoods and Environmental Dependence: Methods for Research and Fieldwork*. Bogor, Indonesia: CIFOR.

Banks, N., D. Hulme, and M. Edwards. 2015. NGOs, States and Donors Revisited: Still Too Close for Comfort? *World Development* 66:707–718. https://doi.org/10.1016/j.worlddev.2014.09.028.

Barnes, C. and F. Van Laerhoven. 2013. Helping to Self-Help? External Interventions to Stimulate Local Collective Action in Joint Forest Management, Maharashtra, India. *International Forestry Review* 15(1):1–17. https://doi.org/10.1505/146554813805927246.

Barnes, C. and F. Van Laerhoven. 2015. Making it last? Analysing the Role of NGO Interventions in the Development of Institutions for Durable Collective Action in Indian Community. *Environmental Science and Policy* 53:192–205. https://doi.org/10.1016/j.envsci.2014.06.008.

Bauch, S. C., E. O. Sills, and S. K. Pattanayak. 2014. Have We Managed to Integrate Conservation and Development? ICDP Impacts in the Brazilian Amazon. *World Development* 64(S1):S135–S148. https://doi.org/10.1016/j.worlddev.2014.03.009.

Baur, I., K. Liechti, and C. R. Binder. 2014. Why Do Individuals Behave Differently in Commons Dilemmas? The Case of Alpine Farmers Using Common Property Pastures in Grindelwald, Switzerland. *International Journal of the Commons* 8(2):657–685. https://doi.org/10.18352/ijc.469.

Bebbington, A. 1999. Capitals and Capabilities: A Framework for Analysing Peasant Viability, Rural Livelihoods and Poverty. *World Development* 27(12):2012–2044. https://doi.org/10.1016/S0305-750X(99)00104-7.

Bebbington, A. 2005. Donor–NGO Relations and Representations of Livelihood in Nongovernmental Aid Chains. *World Development* 33(6):937–950. https://doi.org/10.1016/j.worlddev.2004.09.017.

Bebbington, A. and T. Perreault. 1999. Social Capital, Development, and Access to Resources in Highland Ecuador. *Economic Geography* 75(4):395–418. https://doi.org/10.2307/144478.

Bebbington, A., R. Rojas, L. Hinojosa, D. Muñoz, E. Guerrero, and E. Martinez. 2002. *Contributions of the Dutch Co-Financing Program to Rural Development and Rural Livelihoods in the Highlands of Perú and Bolivia: Synthesis Report. Steering Committee for the Evaluation of the Netherlands Co-financing Programme.* Boulder, Colorado: Ministry of Foreign Affairs, The Netherlands. https://www.research.manchester.ac.uk/portal/en/publications/contributions-of-the-dutch-cofinancing-program-to-rural-development-and-rural-livelihoods-in-the-highlands-of-peru-and-bolivia-synthesis-report(b25ad5c6-5ad9-4121-a45c-6dacb4384c21)/export.html.

Bebbington, A., S. Hickey, and D. C. Mitlin. 2007. *Can NGOs Make a Difference? The Challenge of Development Alternatives*. London: Zed Books.

Berge, E. and F. Van Laerhoven. 2011. Governing the Commons for Two Decades: A Complex Story. *International Journal of the Commons* 5(2):160–187. https://doi.org/10.18352/ijc.325.

Berkes, F. 2007. Community-based Conservation in a Globalized World. *Proceedings of the National Academy of Sciences* 104(39):15188–15193. https://doi.org/10.1073/pnas.0702098104.

Blomley, T. and H. Ramadhani. 2006. Going to Scale with Participatory Forest Management: Early Lessons from Tanzania. *International Forestry Review* 8(1):93–100. https://doi.org/10.1505/ifor.8.1.93.

Brass, J. 2016. *Allies or Adversaries? NGOs and the State in Africa*. New York: Cambridge University Press. https://doi.org/10.1017/CBO9781316678527.

Campbell, B., J. A. Sayer, P. Frost, S. Vermeulen, M. Ruiz Pérez, A. Cunningham, and R. Prabhu. 2001. Assessing the Performance of Natural Resource Systems. *Conservation Ecology* 5(2):22. https://doi.org/10.5751/ES-00316-050222.

Chambers, R. and G. Conway. 1992. *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century. IDS Discussion Paper 296.* Brighton, UK: Institute of Development Studies.

Chhetri, B. B. K, J. F. Lund, and Ø. Nielsen. 2012. The Public Finance Potential of Community Forestry in Nepal. *Ecological Economics* 73(15):113–121. https://doi.org/10.1016/j.ecolecon.2011.09.023.

Chhotray, V. 2007. The 'Anti-politics machine' in India: Depoliticisation Through Local Institution Building for Participatory Watershed Development. *The Journal of Development Studies* 43(6):1037–1056. https://doi.org/10.1080/00220380701466526.

Cox, M., G. Arnold, and S. Villamayor Tomás. 2010. A Review of Design Principles for Community-Based Natural Resource Management. *Ecology and Society* 15(4):38. https://doi.org/10.5751/ES-03704-150438.

De Koning, J. 2014. Unpredictable Outcomes in Forestry – Governance Institutions in Practice. *Society & Natural Resources* 27(4):358–371. https://doi.org/10.1080/08941920.2013.861557.

Dietz, T., E. Ostrom, and P. Stern. 2003. The Struggle to Govern the Commons. *Science* 302:1907–1912. https://doi.org/10.1126/science.1091015.

Edwards, M. 1999. NGO Performance–What Breeds Success? New Evidence from South Asia. *World Development* 27(2):361–374.

Edwards, M. 2009. *Civil Society*. Cambridge: Polity Press.

FAO (Food and Agricultural Organisation). 2014. *State of the World's forests: Enhancing Socioeconomic Benefits from Forests*. Rome, Italy: Food and Agricultural Organisation.

Fleischman, F. 2014. Why Do Foresters Plant Trees? Testing Theories of Bureaucratic Decision-Making in Central India. *World Development* 62:62–74. https://doi.org/10.1016/j.worlddev.2014.05.008.

Gardner, R., E. Ostrom, and J. M. Walker. 1990. The Nature of Common-Pool Resource Problems. *Rationality and Society* 2(3):335–358. https://doi.org/10.1177/1043463190002003005.

Gerring, J. 2007. Is There a (Viable) Crucial Case Method? *Comparative Political Studies* 40(3):231–253. https://doi.org/10.1177/0010414006290784.

Gibson, C. C., J. T. Williams, and E. Ostrom. 2005. Local Enforcement and Better Forests. *World Development* 33(2):273–284. https://doi.org/10.1016/j.worlddev.2004.07.013.

Hardin, G. 1968. The Tragedy of the Commons. *Science* 162(3859):1243–1248. https://doi.org/10.1126/science.162.3859.1243.

Henry, A. D, and T. Dietz. 2011. Information, Networks, and the Complexity of Trust in Commons Governance. *International Journal of the Commons* 5(2):188–212. https://doi.org/10.18352/ijc.312.

Hulme, D. 2000. *Protecting and Strengthening Social Capital in Order to Produce Desirable Development Outcomes. Social Development Systems for Coordinated Poverty Eradication Paper No. 4.* Manchester, UK: University of Manchester.

Ingram, V., M. Ros-Tonen, and T. Dietz. 2015. A Fine Mess: Bricolaged Forest Governance in Cameroon. *International Journal of the Commons* 9(1):41–64. https://doi.org/10.18352/ijc.516.

IUCN (International Union for Conservation of Nature). 2012. *Livelihoods and Landscapes Strategy: Results and Reflections*. Gland, Switzerland: International Union for Conservation of Nature.

Kashwan, P. 2016. Integrating Power in Institutional Analysis: A Microfoundation Perspective. *Journal of Theoretical Politics* 28(1):5–26. https://doi.org/10.1177/0951629815586877.

Kashwan, P. and V. Lobo. 2014. Of Rights and Regeneration: The Politics of Governing Forest and Non-forest Commons. In *Democratizing Forest Governance in India,* eds., S. Lele and A. Menon, 351–377. Delhi, India: Oxford University Press.

Lemos, M. C. and A. Agrawal. 2006. Environmental Governance. *Annual Review of Environment and Resources* 31:297–325. https://doi.org/10.1146/annurev.energy.31.042605.135621.

Mansuri, G. and V. Rao. 2013. Can Participation be Induced? Some Evidence from Developing Countries. *Critical Review of International Social and Political Philosophy* 16(2):284–304. https://doi.org/10.1080/13698230.2012.757918.

McGinnis, M. D. 2011. An Introduction to IAD and the Language of the Ostrom Workshop: A Simple Guide to a Complex Framework. *Policy Studies Journal* 39(1):169–183. https://doi.org/10.1111/j.1541-0072.2010.00401.x.

Mersha, A. A. and F. Van Laerhoven. 2016. A Gender Approach to Understanding the Differentiated Impact of Barriers to Adaptation: Responses to Climate Change in Rural Ethiopia. *Regional Environmental Change* 16(6):1701–1713. https://doi.org/10.1007/s10113-015-0921-z.

Ministry of Tribal Affairs. 2014. *Report of the High Level Committee on Socio-economic, Health, and Educational Status of Tribal Communities in India. Government of India.* http://www.kractivist.org/wpZcontent/uploads/2014/12/TribalZCommitteeZReportZMayZJuneZ2014.pdf.

Mosse, D. 2004. Is Good Policy Unimplementable? Reflections on the Ethnography of Aid Policy and Practice. *Development and Change* 35(4):639–671. https://doi.org/10.1111/j.0012-155X.2004.00374.x.

Olsson, P., C. Folke, and F. Berkes. 2004. Adaptive Comanagement for Building Resilience in Social–Ecological Systems. *Environmental Management* 34(1):75–90. https://doi.org/10.1007/s00267-003-0101-7.

Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action.* Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511807763.

Ostrom, E. 1998. A Behavioral Approach to the Rational Choice Theory of Collective Action. *American Political Science Review* 92(1):1–22. https://doi.org/10.2307/2585925.

Ostrom, E. 2005. *Understanding Institutional Diversity.* Princeton, NJ: Princeton University Press.

Ostrom, E., M. A. Janssen, and J. M. Anderies. 2007. Going Beyond Panaceas. *Proceedings of the National Academy of Sciences* 104(39):15176–15178. https://doi.org/10.1073/pnas.0701886104.

Pagdee, A., Y. Kin, and P. J. Daugherty. 2006. What Makes Community Forest Management Successful: A Meta-study from Community Forests Throughout the World. *Society & Natural Resources* 19(1):33–52. https://doi.org/10.1080/08941920500323260.

Persha, L., A. Agrawal, and A. Chhatre. 2011. Social and Ecological Synergy: Local Rulemaking, Forest Livelihoods, and Biodiversity Conservation. *Science* 331(6024):1606–1608. https://doi.org/10.1126/science.1199343.

Porter-Bolland, L., E. A. Ellis, M. R. Guariguata, I. Ruiz-Mallén, S. Negrete-Yankelevich, and V. Reyes-García. 2012. Community Managed Forests and forest protected areas: An Assessment of Their Conservation Effectiveness Across the Tropics. *Forest Ecology and Management* 268:6–17. https://doi.org/10.1016/j.foreco.2011.05.034.

Poteete, A., and E. Ostrom. 2004. Heterogeneity, Group Size and Collective Action: The Role of Institutions in Forest Management. *Development and Change* 35(3):435–461. https://doi.org/10.1111/j.1467-7660.2004.00360.x.

Pretty, J. and H. Ward. 2001. Social Capital and the Environment. *World Development* 29(2):209–227. https://doi.org/10.1016/S0305-750X(00)00098-X.

Ramalingam, B. 2013. *Aid on the Edge of Chaos: Rethinking International Cooperation in a Complex World*. Oxford: Oxford University Press.

Rist, L., A. Felton, L. Samuelsson, C. Sandström, and O. Rosvall. 2013. A New Paradigm for Adaptive Management. *Ecology & Society* 18(4):63. https://doi.org/10.5751/ES-06183-180463.

Schlager, E. 2016. Introducing the "The Importance of Context, Scale, and Interdependencies in Understanding and Applying Ostrom's Design Principles for Successful Governance of the Commons". *International Journal of the Commons* 10(2):405–416. https://doi.org/10.18352/ijc.767.

Scoones, I. 1998. *Sustainable Rural Livelihoods: A Framework for Analysis. Working Paper 72*. Institute for Development Studies. Brighton, UK: IDS.

Scoones, I. 2009. Livelihoods Perspectives and Rural Development. *The Journal of Peasant Studies* 36(1):171–196. https://doi.org/10.1080/03066150902820503.

Sen, A. 1981. *Poverty and Famines: An Essay on Entitlement and Deprivation*. Oxford: Clarendon Press.

Stringer, L. C., A. J. Dougill, E. Fraser, K. Hubacek, C. Prell, and M. S. Reed. 2006. Unpacking "participation" in the Adaptive Management of Social–Ecological Systems: A Critical Review. *Ecology and Society* 11(2):39. https://doi.org/10.5751/ES-01896-110239.

Sunderlin, W. D., A. Angelsen, B. Belcher, P. Burgers, R. Nasi, L. Santoso, and S. Wunder. 2005. Livelihoods, Forests, and Conservation in Developing Countries: An Overview. *World Development* 33(9):1383–1402. https://doi.org/10.1016/j.worlddev.2004.10.004.

Thin, N. and P. Van Gardingen. 2004. Participatory Forestry: Sharable Lessons for Better Management of Commons. *Forests, Trees and Livelihoods* 14(2–4):229–242. https://doi.org/10.1080/14728028.2004.9752495.

Van Laerhoven, F. and C. Barnes. 2014. Communities and Commons: The Role of Community Development Support in Sustaining the Commons. *Community Development Journal* 49(suppl 1):i118–i132. https://doi.org/10.1093/cdj/bsu005.

Weinbaum, K. Z., J. S. Brashares, C. D. Golden, and W. M. Getz. 2013. Searching for Sustainability: Are Assessments of Wildlife Harvest Behind the Times? *Ecology Letters* 16(1):99–111. https://doi.org/10.1111/ele.12008.

Westermann, O., J. Ashby, and J. Pretty. 2005. Gender and Social Capital: The Importance of Gender Differences for the Maturity and Effectiveness of Natural Resource Management Groups *World Development* 33(11):1783–1799.

Wright, G. and K. Andersson. 2013. Non-Governmental Organizations, Rural Communities and Forests: A Comparative Analysis of Community - NGO Interactions. *Small-Scale Forestry* 12(1):33–50. https://doi.org/10.1007/s11842-012-9206-2.

Yaziji, M. and J. Doh. 2009. *NGOs and Corporations: Conflict and Collaboration*. New York: Cambridge University Press. https://doi.org/10.1017/CBO9780511626708.

Appendix 1

Case selection: Village profiles

Attribute	Control village	Intervention village
Number of households	54	36
Population	221	136
Languages spoken	Koya, Telugu	Koya, Telugu
Literacy	64.06%	50.5%
Houses	Mostly thatched huts, some diorama (government provided concrete slab)	100% Thatched huts
Average individual landholding	2.6 ha/household	1.9 ha/household
% Landless	14.3%	21.7%
Crops grown	Rice, sorghum, sesame, pulses	Rice, sorghum, sesame, pulses
(Former) Classification of forest	Reserve/VSS (forest protection committee run by FD)	VSS (forest protection committee run by FD)
Forest type	Dry deciduous Mix of plantations (teak, bamboo, eucalyptus) and natural forest	Dry deciduous Mix of plantations (teak, bamboo, eucalyptus) and natural forest
Forest size	500 ha	700 ha
Per capita forest area	2.26 ha/person	5.15 ha/person
Forest dependence	Firewood for cooking and heating, house building, NTFP collection for subsistence and sale, cattle grazing, hunting	Firewood for cooking and heating, house building, NTFP collection for subsistence and for sale, cattle grazing, hunting
Sources of income	Seasonal employment: agriculture, NTFP collection, National Rural Employment Guarantee Scheme	Seasonal employment: agriculture, NTFP collection, National Rural Employment Guarantee Scheme

Appendix 2

Operationalization of the outcome variable and data collection methods

Indicator	Motivation for selection	Data collection tool
Ability to deal with appropriation dilemmas		
Distance to harvest NTFPs has increased over past 5 years (% respondents)	Indicators of the degree of overharvesting (in % of respondents). Taken together, increase in the distance to harvest NTFPs and decrease in the quality of NTFPs over the past five years would suggest the closer NTFPs are being depleted or there is increased competition for them. We would not expect this pattern through pure biophysical changes (Weinbaum et al. 2013)	Household questionnaire
Quality of NTFPs harvested has decreased over past 5 years (% of respondents)		
Ability to deal with provision dilemmas		
Evidence of stock maintenance (e.g. decongestion and mounding of bamboo, pruning of tendu)	Indicator of the degree to which the community invests directly in maintaining the forest stock	Forest plots
Active community monitoring	Indicator of the degree to which the community invests in the monitoring system to maintain the forest stock	

Indicator	Motivation for selection	Scoring	Motivation for scoring	
Livelihoods portfolio: Capitals				
Natural				
Species richness	The number of different species in a forest plot. Generates an understanding of forest stand biodiversity	3 = Above the upper confidence interval (mean+2.st.dev.) 2 = Between the lower confidence level and upper confidence level 1 = Below the lower confidence level (mean-2.st.dev.)	Estimates software (http://viceroy.eeb.uconn.edu/estimates/) was used for estimating the theoretical maximum species richness of our forest plots. We used the expected maximum number of species given a reference sample. The scores indicate the degree to which the forest plots deviate on average from this theoretical maximum number of species. We use strict confidence levels of 2 standard deviations due to the low sample number	Forest plots

Appendix 2 (continued)

Indicator	Motivation for selection	Scoring	Motivation for scoring	
Cut damaged stock	Unsustainable cutting, grazing and fire damage are the three most common stressors in forests. Measuring all three stressors in our forest plots indicates the possibility for regeneration of forest stock	3 = The highest recorded cut damage of any species is <33% of individuals 2 = The highest recorded cut damage of any species is between 33–66% of individuals 1 = The highest recorded cut damage of any species is >67% of individuals	We record damage *per species* rather than at the level of the forest plot as each species contributes to the health of the natural capital and cannot be substituted by other species	Forest plots
Grazing damaged stock		3 = <33% of forest plots contained evidence of grazing 2 = 33–66% of forest plots contained evidence of grazing 1 = >67% of forest plots contained evidence of grazing	Evidence of grazing was the presence of a grazing animal or dung. Binary indicator per forest plot	Forest plots
Fire damaged stock		3 = <25% of forest plots contained evidence of fire damage 2 = 25–49% of forest plots contained evidence of fire damage 1 = >50% of forest plots contained evidence of fire damage	We use lower boundaries for measuring fire damaged stock as fire can spread to affect a larger area of natural capital (whereas cut or grazing damaged stock does not have this characteristic)	Forest plots
Human				
Stated sustainability of harvesting NTFPs	Assesses knowledge of sustainable harvesting practices We equate stated harvesting behaviour with knowledge of sustainable harvesting. The indicator cut damaged stock under natural capital indicates whether this knowledge is actually carried out in practice	3 = >50% of households state that they harvest <33% of NTFP species unsustainably 2 = >50% of households state that they harvest 33–66% of NTFP species unsustainably 1 = >50% of households state that they harvest >67% of NTFP species unsustainably	The unit of analysis is the household as we are interested in how widespread knowledge of sustainable harvesting practices is From the list of NTFPs collected we selected the NTFPs for which there is scientific literature on (un)sustainable harvesting to analyse whether each NTFP was stated to be collected in a sustainable manner. By simply scoring the percentage of NTFPs harvested unsustainably per household, each NTFP is given an equal weighting	Household questionnaire

Appendix 2 (continued)

Indicator	Motivation for selection	Scoring	Motivation for scoring	
Awareness of FRA	Assesses community's awareness of their land rights, critical for livelihood development	3 = >67% of households are aware of the FRA 2 = 33–66% of households are aware of the FRA 1 = <33% of households are aware of the FRA		Household questionnaire
Personal consumption and medicinal use of NTFPs	Health is seen as an important indicator in the SLA. Here we focus on access to food and medicine from the forest given the location of the cases and local preference for avoiding hospitals	3 = >67% of households collect >67% of NTFPs at least partly for subsistence and bartering purposes 2 = 33–66% of households collect >67% of NTFPs at least partly for subsistence and bartering purposes 1 = <33% of households collect >67% of NTFPs at least partly for subsistence and bartering purposes	We include barter as the NTFPs were only bartered for rice and salt – i.e. essential foods they couldn't produce themselves NTFPs could be used for subsistence *and* commercial purposes. Therefore our score includes NTFPs that are *at least partly* used for subsistence and bartering. We put the cut off at 67% as an indication of a high level of access to NTFPs for personal consumption.	Household questionnaire
Knowledge of management and marketing of NTFPs	These skills are considered to be important for livelihood development in a forest-based economy	3 = >50% of households with highest held education > grade 9 AND >1 people with specific resource management knowledge 2 = EITHER, >50% of households with highest held education of grade 1–9 AND >1 person with specific resource management knowledge OR >50% of households with highest held education > grade 9 AND 0 or 1 person with specific resource management knowledge 1 = >50% of households with highest held education of grade 1–9 AND 0 or 1 person with specific resource management knowledge	We use two different types of knowledge. A general secondary education should mean the individual has knowledge of how to systematically keep records and the basic skills needed to market NTFPs. 10th grade is when the Indian Certificate of Secondary Education is taken so this is seen as the cut off. We specify 2 people with specific resource management knowledge as this means there is a back up if 1 person chooses not to engage in NTFP management.	Household questionnaire

Appendix 2 (continued)

Indicator	Motivation for selection	Scoring	Motivation for scoring	
Social				
Level of conflict	Presence of conflict is indicative of low level of trust within the community (Henry and Dietz 2011).	3= < 33% stated that there is some or a lot of community conflict 2= 34–66% stated that there is some or a lot of community conflict 1 = >67% stated that there is some or a lot of community conflict	We asked respondents if there was a lot, some or no conflict in their community. Given the sensitive and subjective nature of perceptions on conflict, in our scoring we do not distinguish between some or a lot of conflict.	Household questionnaire
Bonding: shared cultural events	Represents the building of specific reciprocity and mobilizing solidarity within a community to facilitate cohesion and internal knowledge sharing (Bebbington and Perreault 1999).	3 = Possibility to meet as a subgroup of the whole community > once a month 2 = Possibility to meet as a subgroup of the whole community between once a month and every three months 1 = Possibility to meet as a subgroup < every three months	We deem shared cultural events to be often when they are held at least once per month, and infrequent when they are held less than every three months.	Household questionnaire
Experience of formal committees	This indicates whether the community is used to determining formal positions within groups (such as chair, secretary)	3 = Experience of >1 formalised active groups with no outspoken negative experiences of working in such formal groups 2 = EITHER 1 formalised active group with no outspoken negative experiences of working in such formal groups OR >1 formalised active groups with negative experiences of working in such formal groups 1 = 0 or 1 active formalised group with outspoken negative experiences of working in such formal groups	By a group we include groups formed for any goal or purpose. In quantifying the number of groups, this is relative to the size of the community and we count above any political parties present as we expect them to be present in the area. By 'negative experience of such groups' we refer to any such groups in the community (including now defunct).	Household questionnaire

Appendix 2 (continued)

Indicator	Motivation for selection	Scoring	Motivation for scoring	
Bridging: connections with key external stakeholders	This gives an indication of the ability of the community to expand its network, and ability to interact with groups of diverse interests, which is critical to the diffusion of knowledge (Bebbington and Perreault 1999)	3 = Independent relationship with all 3 types of key external stakeholders 2 = Independent relationship with 2 types of key external stakeholders 1 = Independent relationship with 1 type of key external stakeholders, or no external relationships	An independent relationship means community members have direct contact with a key external stakeholder. The three types of key external stakeholder are an NGO/CBO, the ITDA, neighbouring communities	Observations
Financial				
NTFPs with financial potential	NTFPs present a potentially useful cash income source in forested areas where there are little alternatives (Chhetri et al. 2012). We measure the variety of NTFPs that generate income for the community (Bauch et al. 2014). The actual value gained from commercial NTFPs can only be determined through a longitudinal study in which quantities of NTFPs harvested can be reliably obtained.	3 = >67% of households collect >67% of NTFPs at least partly for a commercial purpose 2 = 33–66% of households collect >67% of NTFPs at least partly for a commercial purpose 1 = <33% of households collect >67% of NTFPs at least partly for a commercial purpose	NTFPs could be used for subsistence *and* commercial purposes. Therefore our score includes NTFPs that are *at least partly* used for commercial purposes. We put the cut off at 67% as an indication of a high level of access to NTFPs for commercial purposes.	Household questionnaire

Appendix 2 (continued)

Indicator	Motivation for selection	Scoring	Motivation for scoring	
Number of months of employment provided by collecting NTFPs	This indicates whether income from NTFPs is spread throughout the year, which increases the potential for employing wider livelihood strategies.	3 = ≥6 months per year during which >3 NTFPs are collected for commercial purposes by ≥ 50% of households 2 = 3–5 months per year during which >3 NTFPs are collected for commercial purposes by ≥ 50% of households 1 = <3 months per year during which >3 NTFPs are collected for commercial purposes by ≥ 50% of households	We consider >3 NTFPs being collected for commercial purposes as a substantial portion of time in the month being invested. We choose ≥ 50% as a cut off for determining the score as when the majority of households are involved this indicates the potential access to this capital the rest could enjoy.	Household questionnaire, NTFP seasonality during focus group
Employment from government schemes	This represents the other employment option in the area. It provides an indication of the level of income generating activities	3 = Average day rate of the schemes provided is around the WB Global Poverty Line and reliable work is available for ≥4 months per year, 2 = EITHER average day rate of the schemes provided is less than the WB Global Poverty Line OR reliable work is available for < 4 months per year 1 = BOTH the average day rate of the schemes provided is less than the WB Global Poverty Line AND work is available for less than 4 months per year	Indian government's Below Poverty Line (BPL) calculation is known as being extremely low (27 rupees per day in rural India) and has faced severe criticism. Therefore we compare to the World Bank Global Poverty line: 130 rupees per day	Household questionnaire
Community fund from forest activities	Access to credit or bank accounts is a frequently used indicator for financial capital because it provides a buffer in hard times. Whether the community pools money from collective forestry endeavours is therefore appropriate in this context	3 = Present and regular significant income 2 = Present but no significant or irregular income 1 = Not present	Significant is in relation to the World Bank global poverty line of 130 rupees per day.	Household questionnaire, Interviews with external actors

Appendix 2 (continued)

Indicator	Motivation for selection	Scoring	Motivation for scoring	
Physical				
Transport availability	Access to communal and individual physical capitals increases the livelihood strategy options available	3 = Near road, own transport or frequent public transport options 2 = Near road, reliant on irregular public transport 1 = Isolated from a road, limited public transport on nearest road		Observations from frequent visits to the community
Infrastructure		3 = Two of the three types of infrastructure present 2= One of the three types of infrastructure present 1= None of the three types of infrastructure present	The three types of infrastructure are lights, irrigation and water supply. They are understood as being the basic locally appropriate infrastructure in rural areas aside from roads	Observations from frequent visits to the community
Shelter		3 = Appropriate housing and can maintain 2 = Have appropriate housing, lack of ability to maintain 1 = Lack of appropriate housing		Observations from frequent visits to the community
Forest produce tools		3= Focus group respondents own value addition tools 2= Focus group respondents own tools to increase efficiency and/or effectiveness of traditional practices 1= Focus group respondents own simple traditional tools	This indicator was scored in focus group discussions as NTFP collection and processing is done in groups and therefore ownership within the community rather than per household is sufficient to determine secure access	Focus group discussion

Appendix 2 (continued)

Indicator	Motivation for selection	
Livelihoods portfolio: Strategies		
Instrumental (surviving)		
Cultivation: % households engaging in cultivation, average size of agricultural land per household (acres), main crops	Cultivation is a locally appropriate strategy. The total of the separate indicators give an impression of the degree to which households engage in cultivation.	Household questionnaire
Daily wage labour: % households engaging in this form of employment	This is common in rural areas. It does not provide secure income. The source could be government or private contractors	
Livestock: % households owning ≥3 of either cow, buffalo, ox or calves	Most households will own a few chickens but for livestock to represent a significant strategy we state that the households must own at least 3 animals which potentially create more significant ongoing benefits.	
Processing and selling NTFPs	This is a strategy to add value to the NTFPs available.	
Hermeneutic (adding meaning) and emancipatory (changing structures under which livelihoods are determined)		
Determined through focus group discussions and household questionnaire		

Appendix 3

Focus group data collection

Topic	Link to framework	Respondents	Structure
Introduction of research team and purpose of research	None. Purpose was to build rapport	Village wide meeting. Attendance fluctuated. Effort made to engage and include women	Researchers introduced themselves, affiliation, and the purpose of research
Community Mapping Exercise	Natural Capital		Researchers brought a map from the forest department and asked respondents to map where they go to harvest forest products
NTFP seasonality	Natural and Financial Capitals		Researchers used a portable chalkboard poster for respondents to map which forest products are available during which months
Forest produce tools availability	Physical Capital		Researchers asked what kind of tools were available to the community

Appendix 4

Livelihood Strategies

Strategy type	Intervention case	Control case
Instrumental		
Cultivation		
% households engaging in cultivation	43	93
Average size of agricultural land per household (ha)	2.6	1.9
Main crops	Rice, sorghum, sesame, pulses	Rice, sorghum, sesame, pulses
Daily wage labour (% households)	70	43
Livestock (% of households owning 3 or more of either cow, buffalo, ox or calves)	87	79
Processing and selling NTFPs	– Alcohol from Mahua flower sold by 2/3 households at r50 per bottle – One off sale in Delhi of mahua flower cakes – Bamboo auction raised r36,111 per household	– Fencing sold at r200 per piece
Hermeneutic		
Engaging in further studies	0	4 people
Cultural continuation	Toddy (local alcohol) consumption and NTFP gathering	
Expanding skills	Bamboo auction	
Emancipatory		
Altering power structures	Holding bamboo auction	
Gaining legal entitlement to land	Claiming CFR rights under FRA	