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Ecological Sustainability for Non-timber Forest Products

Dynamics and Case Studies of Harvesting

Edited by Charlie M. Shackleton, Ashok K. Pandey and Tamara Ticktin

Ecological Sustainability for Non-timber Forest Products

There is growing knowledge about, and appreciation of, the importance of non-timber forest products (NTFPs) to rural livelihoods in developing countries, and to a lesser extent, developed countries. However, there is also an assumption on the part of policy-makers and many managers that any harvesting of wild animal or plant products from the forests and other natural and modified ecosystems must be detrimental to the long-term viability of target populations and species. This book challenges this idea and shows that while examples of such negative impacts certainly exist, there are also many examples of sustainable harvesting systems for NTFPs.

The chapters review and present coherent and scientifically sound information and case studies on the ecologically sustainable use of NTFPs. They also outline a general interdisciplinary approach for assessing the sustainability of NTFP harvesting systems at different scales. A wide range of case studies is included from Africa, Asia and South America, using plant and animal products for food, crafts, textiles, medicines and cosmetics.

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Contents

Figures and tables

Figures

Tables

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Part I

Examining non-timber forest product systems

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1 Introduction

The need to understand the ecological sustainability of non-timber forest products harvesting systems

Charlie M. Shackleton, Tamara Ticktin and Ashok K. Pandey

Introduction

The importance of non-timber forest products (NTFPs) in rural livelihoods in developing countries has become widely acknowledged over the last decade or so within the research and, increasingly, policy arenas, on the basis of numerous studies from around the world. Indeed, there has been a tenfold increase in the annual number of research papers published over the last 20 years (Figure 1.1). Most of these studies are from developing countries, but they do include developed countries (e.g. Kim *et al.* 2012, Poe *et al.* 2013,

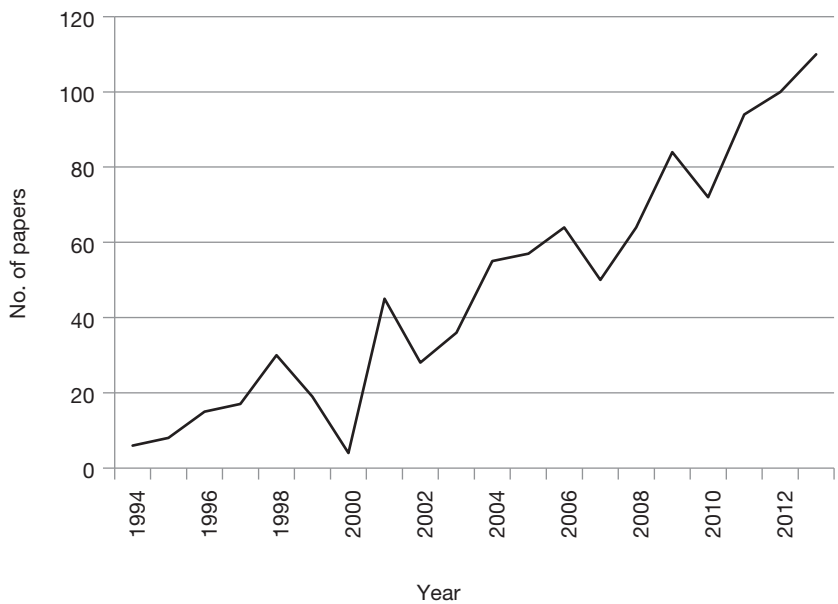

Figure 1.1 The increase in research publications on NTFPs over the last two decades (the data reflect the number of papers returned by Scopus to a single search on the term 'non timber forest products' in all search fields)

Sténs and Sandström 2013). Additionally, most are from rural areas, albeit with a smattering from urban settings (e.g. Kilchling *et al.* 2009, Poe *et al.* 2013, Kaoma and Shackleton 2014), although with increasing urbanization this distinction is blurred with significant markets for rural NTFPs imported into towns and cities (Lewis 2008, Padoch *et al.* 2008, McMullin *et al.* 2012). Two pertinent findings of many of these studies is that NTFPs generally contribute in many different ways to local livelihoods (see Chapter 2) and that when translated into income terms many households earn a significant proportion of their income (cash and/or non-cash) from NTFPs (Shackleton *et al.* 2007, Angelsen *et al.* 2014). In other words, they are not simply minor products of little value, but rather they are vital components of livelihoods, and in some instances, of local and regional economies. This requires that they, and the land on which they are found, are managed in a responsible manner to ensure that these livelihood benefits continue to accrue to rural, and often impoverished, people.

Despite the importance of NTFPs in the livelihoods of rural communities, government agencies in most countries place considerable restrictions on which NTFPs can be harvested and in which quantities. This is interpreted as being a result of one or more of the following three reasons:

- The legacy of colonial restrictions and central government controls during much of the nineteenth and early twentieth centuries (Vandergeest and Peluso 2006a and 2006b, McLain and Lawry Chapter 15). While there has been a growing move towards devolution of forest ownership and governance over the last decade or two (Ambus and Hoberg 2011, Lawry *et al.* 2012), restrictive policies on the use of biodiversity continue to linger as an echo of the previous century of prohibitions and control (Ribot *et al.* 2006, Conkleton *et al.* 2012).
- Countering the calls for increased devolution of control and management of forests and NTFPs to indigenous peoples are the widely publicized concerns related to global biodiversity loss. Whilst such loss is a result of multiple causes (Krauss *et al.* 2010, Visconti *et al.* 2011), governments and authorities use this as an argument to limit harvesting of biodiversity resources, unless regulated by them. Such regulation is frequently associated with revenue streams for the authorities (Ribot *et al.* 2006).
- There are relatively few studies on the approaches to and impacts of harvesting and guidelines for promoting ecological sustainability. Consequently, many authorities adopt a precautionary approach rather than an adaptive one (Alexander and McLain 2001, Shackleton *et al.* 2009). The absence of clear guidelines is largely a result of the daunting multitude of NTFP species for which in-depth studies are required (Ticktin and Shackleton 2011). Moreover, this challenge is magnified by the need to further understand how harvesting impacts and responses differ in different locations and contexts even for the same species (Gaoue and Ticktin 2010). Consequently, management of most NTFPs is based

on limited and frequently untested western scientific assumptions and knowledge of the species autecology and its response to harvesting. Whilst there is undoubtedly an immense wealth of local ecological knowledge about NTFP species and their responses to various factors (e.g. Gaoue and Ticktin 2009, Youn 2009), including harvesting, very little of this has been codified and is therefore frequently overlooked by most formal forest or conservation management authorities (Love and Jones 2001), although there are exceptions (e.g. Shanley and Stockdale 2008, Rist *et al.* 2010).

The combined consequence of these three positions is that many conservation and forestry management authorities view the harvesting of wild resources as contrary to the health of the species and ecosystems in which they occur (Nygren 2004, Rist *et al.* 2010). They typically view harvesting as an activity destructive of the individual, the species and, over the long term, the ecosystem. Thus, they are loath to permit access to lands and resources under their care for the harvesting of NTFPs (Wilshusen *et al.* 2002, Shackleton *et al.* 2009, Rist *et al.* 2010).

This stereotypical view of the assumed inevitable negative effects of harvesting can be countered at a number of levels. The first is that it ignores that all ecosystems on earth have been impacted by human actions over millennia, i.e. humans are part of nature, not external to it. Humans have inhabited, transferred species into, burned, harvested and herded livestock over all ecosystems to a greater or lesser degree, even those deemed as pristine or the last remnants of untouched nature (Fairhead and Leach 1995, Tipping *et al.* 1999, Barlow *et al.* 2012). Second, additional to these anthropogenic effects shaping community structure and composition over thousands of years is the current reality of global climate change which is altering species growth rates, competition and relative performance and hence the composition of biological communities and ecosystems even in sparsely inhabited regions (e.g. Foden *et al.* 2007, Huber *et al.* 2007), which further emphasises that no systems are immune from human impacts. Thirdly, it assumes that ecosystems, species distributions and the relative dominance or presence of individual populations are relatively static, as well as the social context in which they are used or not. Yet, it is now well appreciated that all ecosystems are dynamic, in constant change, which alters the relative ratios of species to one another in time and space and hence and their contributions to ecosystem dynamics (Garmestani *et al.* 2009). All ecosystems are also subjected, to some degree, to multiple external shocks and stresses such as fires, tornados, earthquakes, pest outbreaks and droughts which have devastating and long-lasting effects on species composition and community structure (Scheffer *et al.* 2001). Thus, focusing on the prevention of NTFP harvesting as a means to limit change or potentially negative impacts to populations or species ignores all the other pressures and changes that populations and ecosystems are exposed to, some human mediated, some not, and with sometimes detrimental impacts whilst

at other times positive ones. The last, which is the subject of this book, is that not all harvesting results in negative consequences for the species or systems concerned. Just because humans extract NTFPs does not mean that the harvested NTFP population is doomed to extinction, and if widely enough, the species will follow suit. Rather, there is a wide range of species responses to harvesting, which are mediated by the local context, from stimulation, to tolerance, to decline (Ticktin and Shackleton 2011). The trick is therefore, rather than viewing all harvesting as inevitably negative, to understand which species (or functional traits), which harvesting regimens and which contexts are likely to result in negative impacts on NTFP populations and species, and in which situations such negative outcomes are unlikely.

Negative narratives 'seem' to be a lot more common than positive ones. Is this true and why might it be so? Verifying whether it is true is a nigh impossible task. However, one of several catalysts for compiling this book was, what appeared to us to be, increasing incidences of postgraduate theses advocating prescriptions against NTFP use even when contradicted by their own empirical findings. As is common for most research academics each of the editors has been invited from time to time by universities around the world to examine theses written by masters or Ph.D. students. We have been struck by instances where postgraduate students have presented data showing that the harvesting of a specific NTFP, or suite of NTFPs, in a defined location appeared to be sustainable on the basis of the data and empirical results presented in the thesis, and yet in the final conclusion to the thesis, they advocate that harvesting should be limited. They have seemingly been 'indoctrinated' to view all harvesting as detrimental. We have also had some of our own postgraduates do the same in early drafts of their theses. In a slight variation on this, we have encountered instances where some postgraduate theses conclude that the harvesting appears sustainable, but then they add a caveat to the effect that restrictions are nevertheless required because offtake will become unsustainable at some unspecified time in the future in the face of growing human populations in the area and/or increasing commercialization of the resource (which often they have not verified). However, this assumes that local communities or harvesters are unaware of any changes in resource supply and have no agency with respect to their own livelihoods, both of which can be questioned. It also assumes that per capita demand will remain static even in the face of external social and economic influences such as increased rural–urban migration and increased access to markets for modern goods and products, technology, information, government support services and infrastructure, all of which increasingly influence livelihoods and their income sources (and amounts) in even relatively remote communities. Lastly, in the face of rapid urbanization in sub-Saharan Africa and South-East Asia even the assumed population increase in rural villages is not ubiquitous across all sites as individuals and households leave in hope of better prospects in the towns and cities. Thus, the assumed population growth and/or commercialization may not actually occur, and even if it does, it may not be

as soon as is assumed, and even then it might not translate to increased demand as consumer preferences change. Therefore, it is not a foregone conclusion that it will increase the demand for all NTFPs. We fully appreciate that there is no malintent in portraying the final conclusions in such a way even against their own empirical findings. But with inexperience they are less willing to confront a dominant narrative arguing pervasive unsustainability. Many instances of overharvesting can be found, but it is not an inevitable outcome of NTFP harvesting (as this book will show). Consequently, we would encourage a more critical, nuanced, context-specific and evidence-based examination of the species, its responses and the socioeconomic context and drivers at appropriate and defined spatial and temporal scales.

This begs the question of why the negative narrative is so pervasive. Is it because most NTFP harvest systems are indeed unsustainable, or perhaps there is an unconscious bias by researchers to examine mostly unsustainable systems because that allows them to motivate for research funds and provide management recommendations (i.e. why study a system that appears fine and in no need of intervention)? We are unsure, but can identify a few possible hypotheses which require greater examination:

- It reflects the situation on the ground. This may be because:
  - More areas and NTFPs are being harvested unsustainably because of changing conditions and demands.
  - Greater scientific interest is revealing something that has always been extant but overlooked.
  - Increased land transformation which results in people having to harvest from an ever-decreasing area of land.
  - Increasing commercialization and supplies to urban populations and markets.
  - Some combination of two or more of the above.
- It does not reflect the situation of the ground but it is perpetuated as a stereotypical narrative consciously or unconsciously because of:
  - The unconscious bias to publish and share stories of unsustainable use because these are what require intervention to show the credentials of the management agency and perhaps the researcher.
  - Growing expectations of development agencies wishing to promote the NTFP cause to improve income of impoverished rural households and communities in an assumed benign ecological fashion.
  - Development agencies seeking to raise funds for staff and programmes needing to have a 'dire' story to tell.
  - It is the legacy of the dominant protectionist paradigms of forest and resource control from the colonial period.
  - The belief that either the concept of ecological sustainability or the ability to implement strategies to promote it is beyond the capacities of most indigenous peoples.

Given the prevalence of this negative stereotype, we decided to compile this book to:

- profile the importance of measuring and understanding ecological sustainability alongside the growing number of studies on livelihood contributions of NTFPs;
- question the pervasive negative narrative about the rarity or unlikeliness of ecological sustainability;
- illustrate that ecological sustainability is possible and is not unusual, sometimes without management or governance interventions, sometimes after measured interventions; and
- show the importance of viewing ecological sustainability as a spatially and temporally dynamic phenomenon which therefore demands dynamic and context and scale-specific analytical framings.

Format of this book

This book is divided into three parts. The first comprises four chapters. The first chapter introduces the purpose of the book and questions the pervasive narrative that NTFP harvesting is more often than not ecologically unsustainable. The next two chapters introduce the key components of the NTFP harvesting system, namely the users (Chapter 2) and the resources (Chapter 3). The fourth one provides an insightful commentary on the value of having long-term perspectives on both of these systems to have any hope of a deep understanding (if that is at all possible?) and appreciating the dynamics of the system and its processes as a prerequisite for informed management. Thereafter, nine case studies from different continents and types of NTFPs are presented, each illustrating in different ways and to different degrees the ecological sustainability of the NTFP being harvested, or in the case of surf clams in central Chile (Chapter 8) that ecological sustainability is not attainable at the local level under governance systems that assign fixed spatial domains for a spatially variable resource. The last part of the book offers a further three chapters. Two deal with the key determinants of NTFP sustainability, namely commercialization of NTFP demand (Chapter 14) and governance systems (Chapter 15), and both draw extensively from the case study chapters to illustrate key aspects and lessons. The last chapter (Chapter 16) integrates across the earlier ones and the case studies to highlight key messages, the embeddedness of NTFPs and their use within social–ecological systems and therefore the need to analyse NTFPs within dynamic and context-specific frameworks.

The case studies span four continents and a variety of NTFP species and products ranging from animal products such as surf clams in Chile (Chapter 8) and honey in India (Chapter 7), to herbaceous plants (Chapter 13) and the bark (Chapters 11, 12), latex (Chapter 10) and fruits (Chapters 5, 6, 9) of trees. In identifying and selecting case studies we wished to cover a diversity of species, uses and settings. These options were within the primary need to

have case studies where there was good evidence that the current use of the NTFP was ecologically sustainable, at least at the population level. We had hoped for case studies that were so comprehensive that they would include other scales of ecological sustainability, namely genetic, species and ecosystem levels. However, there are no studies that have covered all four levels. This is an important finding in itself, echoing Ticktin (2004). Lastly, we had to see who was able to provide case study chapters within the time constraints available for preparing this book. There are many other researchers doing amazing work in the subject area of ecological sustainability of NTFP harvesting, but they were unable to assist us in the time available. A couple of case studies fell by the wayside as the book progressed, but the excellent case studies included here together cover all the topics that we hoped to address in the book, and we know that they will provide inspiration to other researchers to dig deeper into the dynamics of ecological sustainability of the NTFP systems which they are studying or monitoring.

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2 Non-timber forest products in livelihoods

Charlie M. Shackleton

Introduction

That people from around the world have incorporated numerous plant and animal products into their lives, economies, cultures, traditions and histories is well known, and is the subject of a multitude of academic and non-academic documents across many disciplines. Historically, the use of these products has underlain trade between cultures and continents and the domestication of many present day crops and breeds (Laws 2011), so much so, that most urban citizens in the developed world have forgotten the original wild origins of current day staples in foods (e.g. corn, potatoes, rice, tomatoes, oranges, melons, sugar, coffee, tea, spices), medicines (aspirin, codeine, quinine, strychnine), fibres (cotton, sisal, coir, hemp), resins (lacquer, gum Arabic, rubber, turpentine), dyes (cochineal, indigo, saffron), intoxicants (tobacco, mushrooms, cannabis, opium) and artefacts. While such staple foods, medicines and the like used by the 'western' urban consumer have become domesticated and are now almost exclusively produced in farming systems or replaced by synthetic substitutes, thousands of other animal, plant and fungi species are still widely used by peoples around the world. These species make significant contributions to livelihoods and economies, such that if their abundance or supply is jeopardized, it can have measurable repercussions on the well-being of local communities and households. For example, in India, these biological resources contribute an income equivalent of US$2.7 billion per year and absorb 55% of the total employment in the forestry sector. Moreover, 50% of forest revenues and 70% of forest-based export income come from such resources (Chauhan *et al.* 2008). They provide 50% of the household income for approximately one-third of India's rural population.

It is the harvesting and use of these currently lesser known products and species that are the subject of this book. Collectively, they have come to be termed 'non-timber forest products' (NTFPs). Most are used for direct sustenance and frequently escape the eye of the outside observer or development planner. Many may also be incorporated into local trade networks of small-scale entrepreneurs. A small proportion are being advanced by research and development agencies, and are vying for the attention of the

modern urbanite, and, if successful, are likely to become one of the new crops of tomorrow (Bell *et al.* 2011, Leakey 2012). This chapter will outline the direct and indirect contributions of these NTFPs to various dimensions of local livelihoods, with some reflection on approaches to measure these.

What are non-timber forest products?

Because of the nexus of NTFP research and management between the ecological and social sciences, it has, at various stages, been bedevilled by a wide array of synonyms, terms and definitions. Over the last two to three decades, NTFPs have been variously termed non-wood products, minor forest products, secondary resources, and the like. Over time, there has been some convergence on the term, i.e. non-timber forest products (although the FAO anachronistically still uses the term non-wood products), but there is less agreement on the definition, which natural or abiotic resources constitute NTFPs and the measurement approaches and methods.

It is not my intention here to seek a definition that would have wide appeal or compliance across a broad range of disciplines. Moreover, the seminal paper of Belcher (2003) and the recent analysis of Shackleton *et al.* (2011) provide insightful scrutiny of the basis of defining NTFPs to which I could not do justice here. However, it is necessary that there is reasonable clarity of what we regard as NTFPs as the basis for the remainder of the book. The robust starting point is iteration of the definition coined by de Beer and McDermott (1996) which defines NTFPs as 'all biological materials other than commercial timber extracted from forests for human use'. While subsequent definitions and interpretations may alter a word here and there, the core tenets of the NTFP concept remain vested in, but somewhat expanded beyond, the de Beer and McDermott (1996) definition as the following (Shackleton *et al.* 2011):

- Biological products – for example, seeds, resins, bulbs, bushmeat, mushrooms, insects, bark, thatch grass and the like. It thus excludes abiotic resources (such as water, carbon, sand and stone, to mention a few) and social resources that do not involve harvesting of the product, such as aesthetic uses or recreation potential. Importantly, and at odds with the FAO's use of the term non-wood products, NTFPs includes use of wood products (such as firewood, chewing sticks, timber for carving or utensils and agricultural implements) for domestic use or by small-scale enterprises.
- Consumptive and non-consumptive uses – the consumptive use might be for direct household provisioning, as well as for small-scale trade. Non-consumptive use refers to cultural uses of particular biological products, parts or species.
- Local use and benefit – this is the bridge that links the social and ecological dimensions of NTFPs as a concept and as a management

approach. If extraction of biological products is achieved via large commercial enterprises with head offices and staff external to the local community, then there is limited or no reciprocal flow between the social and the ecological domains, which then eliminates the incentives for sustainable use or conservation of the NTFPs for the benefits of the broader habitats and ecosystems in which they are located.

- All habitats – de Beer and McDermott (1996) were working in forested ecosystems and hence it was entirely logical that their definition pertained to those systems. However, it is now widely accepted that NTFPs occur in and are used by local peoples from a range of habitats and ecosystems, including wetlands, forests, grasslands, savannas and so on. NTFPs can also be sourced from and require management within transformed systems such as agricultural or urban landscapes.
- Self-replicating wild species – although NTFPs can originate from systems transformed by humans, a particular resource loses the status of being an NTFP once it is *largely* human propagated (and ultimately domesticated) by humans (it then becomes a crop or livestock). This self-replication may include indigenous, naturalized or even alien species to the area that are important to local livelihoods.

The roles of NTFPs in local livelihoods

The multiplicity of the terms and definitions is partly a result of the equivalent multiplicity in the roles and values that NTFPs represent or offer to local livelihoods, not to mention the broader ecosystems in which those livelihoods are situated (Figure 2.1). These have received varying degrees of attention and quantification, being greatest among the upper tiers of the value ladder and least towards the lower tiers.

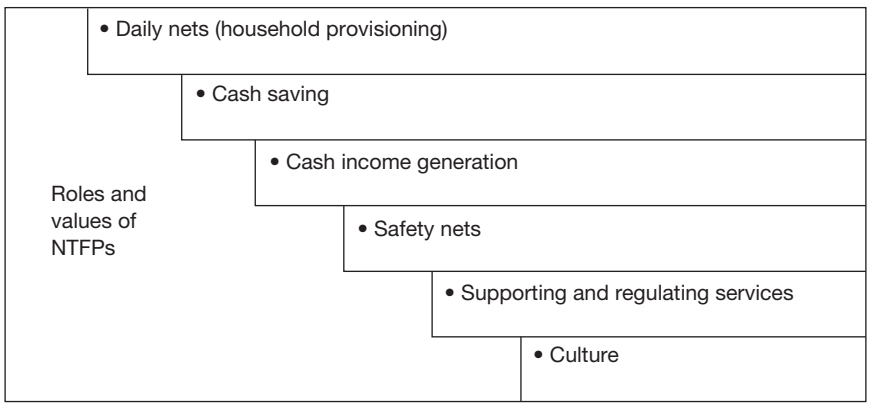

Figure 2.1 The value ladder of NTFPs in livelihoods

NTFPs in household provisioning

Millions of the rural poor, and a significant number of the urban poor, make use of NTFPs on a daily basis to provide some or all of their food, energy, shelter, and medicine needs. This has been termed the daily net (Shackleton and Shackleton 2004) and equates to subsistence use or household provisioning. The amounts used vary between types of NTFPs and between households, from a few pieces of medicinal bark to a few kilograms of food to tens of kilograms of firewood per week. The number of species used is equally variable, but across all NTFP types, most households use several dozen species, which aggregates to several hundred species across a specific community or village. There is concern that knowledge of species traditionally used relatively infrequently is becoming less with increasing traction of formal, external education, market integration, migration and globalization (Benz *et al*. 2000, Cullen *et al*. 2007).

There are several potential measures of the importance of NTFPs in household provisioning, ranging from the number of calories or nutrients provided, the number of days of ill health avoided through use of herbal medicines, the rate of extraction of specific species, or opportunity costs of labour involved in extraction, to replacement values if the equivalent goods had to be purchased on local markets. Econometric measures have held sway over the last decade or so, wherein the cash and non-cash income derived through use of NTFPs is totalled per household over a defined period of time (Angelsen *et al*. 2014). Values are expressed in absolute terms, as well as a percentage of all income streams for that household. A number of proportional values are provided in Table 2.1, illustrating a range of less than 10% in some settings to over 50% in others. Why there is such a range is yet unclear, but it does have a strong relationship to the availability and viability of alternative livelihood options (such as farming) as well as the availability of NTFPs themselves. Some of the differences are also methodological, especially with regard to what NTFPs are included in some studies, but excluded in others. These individual values at the household level aggregate to millions of dollars across villages or regions. For example Schaafsma *et al*. (2011) reported that the total value of firewood, charcoal, poles and thatch was US$42 million annually in the Eastern Arc Mountain region of central Tanzania (it would be many times more if the full range of daily net NTFPs were included in their survey).

Such aggregate numbers are useful in communicating the considerable value associated with the direct use of NTFPs to planners and policy makers. However, they do hide some key facets that are necessary to reveal and appreciate if development and conservation strategies are to be sufficiently targeted at the right audiences.

- Disaggregation by household wealth usually reveals that NTFPs contribute significantly more to total household income of poorer households than richer ones (e.g. Thondhlana *et al*. 2012, Hogarth *et al*. 2013, Angelsen *et al*. 2014).