THE SOCIOECONOMIC EFFECTS OF NON-TIMBER FOREST PRODUCTS COMMERCIALIZATION: A SYSTEMATIC REVIEW

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Abstract

The commercial trade of non-timber forest products (NTFPs) from natural forests has been encouraged as a strategy able to combine environmental conservation and the socioeconomic development of the inhabitants of natural areas. However, accumulated evidence has shown that negative socioeconomic effects can also occur. In order to understand if and when NTFP commercialization can contribute to the socioeconomic development of forest inhabitants, some authors advocate for the importance of monitoring the effects of the commercial trade of NTFPs. Despite that, the effects NTFP trade remain poorly known, making the choice of which parameters should be included in monitoring plans a difficult task. This study aimed to identify the most frequent socioeconomic effects associated with NTFP trade. The analysis relied on a systematic review of empirical studies searched in four databases. The resulting publications (n = 1235) were evaluated against four inclusion criteria: (i) they addressed

forest products derived from plants or fungi, excluding products of animal origin; (ii) the analysis was performed in natural forests, excluding anthropic ecosystems such as agroforests; (iii) they provided evidence of the socioeconomic effects of NTFP trade and (iv) they were based on primary empirical data, excluding literature reviews. From the publications that remained in the sample (n = 66) we evaluated the effects of NTFP trade on 15 parameters grouped under five forms of capital (i.e., financial, social, human, natural and physical). The results showed that positive socioeconomics effects of NTFP trade are more frequently reported than negative effects. However, some negative effects may have important deleterious consequences for people's well-being and thus they should be monitored. First, we should include indicators of the financial capital, especially the contribution of NTFP income to the total income and its regularity across the year. As regards social capital, women's empowerment, group's cohesion and the access to the benefits generated by NTFP trade are important parameters. We still lack empirical evidence of the impacts of NTFP trade to aspects of the human, natural and physical capitals. Despite that, because changes in some of these parameters (e.g., health impacts, access to the resource or to the exploited area) can have drastic consequences to people's well-being, they should also be included in monitoring plans.

Keywords: non-timber forest products, commercial trade, socioeconomic effects, review.

1. Introduction

The harvesting of non-timber forest products (NTFPs) from natural forests is a costumary subsistence activity of communities inhabiting natural areas. Because this was already a traditional livelihood practice, government and non-government organisations began in the 1980s to promote the commercial exploitation of NTFPs, as a strategy allegedly able to

contribute to the maintenance of standing forests, particularly in the tropics, while at the same contributing to alleviate poverty among forest dwellers (Arnold and Ruiz, 2001; Brown, 2002).

Despite initial optimism, the enthusiasm with NTFP trade to contribute to forest conservation and development began to be increasingly replaced by scepticism, when empirical studies began to show that NTFP trade can generate either development opportunities (Marshall and Newton, 2003a; Shackleton, 2007), or risks to the local inhabitants (Angelsen and Wunder, 2003; Ros-Tonen, 2000). To mitigate those effects, some authors have advocated for the importance of monitoring and evaluating the socioeconomic effects of NTFP trade to raise information and enable a better management and commercialization strategy (Setty and Bawa, 2008).

In this regard, the first step in implementing monitoring strategies is to identify the parameters that should be monitored. In this regard, because there are innumerous parameters that can be elected, knowing which are the most common effects of NTFP harvest and trade to the communities can make the process more efficient. If we look at the body of literature published nowadays there are two main types of studies which can help us in this task. There are theoretical studies which present a set of parameters which are more likely to be affected by the trade of NTFPs (Belcher and Schreckenberg, 2007). The second type consist of studies that rely on primary empirical evidence to identify the effects of the commercialization on the well-being of the communities (e.g.Oyerinde, 2008; Sola, 2004). Although the bulk of the present knowledge on the socioeconomic impacts, both negative and positive, is quite extensive, because there are no previous systematic and quantitative reviews of the literature we are still unable to identify which are the most common effects of NTFP trade. This information is important not only to advance our theoretical understanding the benefits and risks of NTFP trade. Additionally, it helps us to design more focused monitoring plans, or the

full list of likely socioeconomic effects could be so large that monitoring would become, in practice, unfeasible. Through a systematic review of the literature, this study identified the most frequent socioeconomic effects at different forms of capital of a livelihood resulting from the harvesting and trading of NTFPs.

2. Methodology

Our study is based on a systematic review of the literature. We identified our sample of studies in two steps. First, we conducted a non-systematic review of the literature to identify (i) the socioeconomic effects of NTFP trade at different forms of capitals identified by other authors, and (ii) the socioeconomic parameters to be used in the classification of the evidence. The second step comprised a systematic review of the literature using the research tools available in the following databases: *Web of Science* (WoS); the publications catalogue of the *Center for International Forestry Research* (CIFOR), the *Scientific Electronic Library Online* (SciELO) and the Indiana University *Digital Library of the Commons* (DLC) (Figure 1).

FIGURE 1 ABOUT HERE

We then evaluated whether the previously identified studies fulfilled four inclusion criteria: (i) they addressed forest products derived from plants or fungi, excluding products of animal origin; (ii) the analysis was performed in natural forests, excluding anthropic ecosystems such as agroforests; (iii) they provided evidence of at least one socioeconomic effect of NTFP trade and (iv) they were based on primary empirical data, excluding literature reviews. Non-duplicate secondary references cited in these studies were included in the sample and were subjected to the same evaluation. At the end of this process, 66 studies remained in our sample.

For each of the articles in our study sample, we assessed information about the socioeconomic effects of NTFP commercialization. These effects were classified in five broad classes of capital according to the Sustainable Livelihoods Framework (Bebbington, 1999): financial, social, human, natural and physical. Within these classes, we evaluated a total of 15 parameters that estimate likely socioeconomic effects (Table 1), using the categories devised in the methodology developed by the Center for International Forestry (CIFOR) (Kusters, 2009; Kusters and Belcher, 2005), but incorporating information from other studies (Belcher and Schreckenberg, 2007; Neuman and Hirsch, 2000; Newton and et al., 2006) (Table 1). The socioeconomic effects associated with these 15 parameters were then classified as follows: negative, when they induced a decrease or harmed the studied socioeconomic parameter and therefore negatively impacted human well-being (e.g., decreased women's empowerment); and positive when they favored human well-being (e.g., increased women's empowerment). Several of the studies in the sample refer to the effects associated with more than one form of capital, or that result from the trade of more than one product in the same locations. Because of that the total number of cases or evidences considered (n = 102) exceeds the total number of studies evaluated (n = 66).

TABLE 1 ABOUT HERE

3. Results

3.1 Characteristics of studies and evidences

The earliest studies incorporated in this review date back to the early 1980s, when the concept of NTFPs was formulated, and extend to 2009, the final year we considered in our search. Within this period, the number of published studies grows continuously and reaches a peak between the years 2004 and 2005, with a subsequent decline after those years (Figure 1a).

120 From the total sample (n=66), there are more studies conducted in South America (21%) and
121 South Asia (19%), followed by South Africa (8%) and Southeast Asia (8%) (Figure 2b, 2c).

122 FIGURE 2 ABOUT HERE

123 Our sample included evidence of the socioeconomic effects (n=102) over twelve out of the
124 fifteen parameters considered initially in our analysis (Table 1). From these, the great majority
125 (91%) presented evidence that support the view that NTFP trade is associated with positive
126 effects to the well-being of forest people, and thus only 9% identified negative effects (Figure
127 2d). By far, the most common aspect evaluated in these publications regard the effects of
128 NTFP harvesting and trade on the communities' financial capital (69%) and, secondly, their
129 social capital (25%) , with only few studies addressing the effects on the human (2%), natural
130 (2%) and physical capitals (2%) (Figure 2d).

131 We proceed by presenting the results according to the category of capital, including
132 illustrative examples of cases reporting a specific effect. Our references therefore refer not to
133 all the cases reporting a specific effect, but only some illustrative examples where this effect
134 was observed.

135

136 **3.2 Effects of NTFPs to the financial capital**

137 A total of 70 cases refer to the effects of NTFP trade to the financial capital of forest people,
138 distributed among three of the considered parameters: monetary income, regularity of
139 monetary income and the role of the strategy as a safety net.

140

141 3.2.1 Monetary income

142 The great majority (93% out of 70) of the evaluations regarding the effects of NTFP trade to
143 the financial capital focus on the contribution of the practice to the monetary income of local
144 dwellers. Whenever the studies evaluated the effects to the monetary income (65 cases), an
145 increase in the total value received by the household or the community was reported (e.g.
146 Emery, 1999; Wickramasingh and Steele, 2008). Although all the communities were also
147 involved in other income generating activities (e.g., agriculture), only for 26 out of the 65
148 cases reported the contribution of NTFPs to the total monetary income of the household or the
149 community as a whole. Most of the cases report two opposite situations. At one of the
150 extremes, about one third of the cases report a small percentage contribution to the monetary
151 income of the households or communities (from 0 to 10% of the total) (Rai and Uhl, 2004).
152 At the other extreme, one third of the cases report a maximal contribution (90 to 100% of the
153 total monetary income) (e.g. Wickramasingh et al., 2008).

154 When we evaluate whether there is an association between the contribution of NTFPs to the
155 total monetary income and the outlet market for trading these products (e.g., food, or
156 cosmetics), we do not find evidence of a clear pattern. There are, for instance, communities
157 trading craftworks which contribute up to 20% of the total monetary income of these
158 communities (Sola, 2004), while in other communities trading handicrafts this value can go
159 up to almost 80% of the total monetary income (Shackleton and Campbell, 2007).

160

161 3.2.2 Regularity of the monetary income

162 Only 4% (3 out of 70) of the cases reported evidence of the effects of NTFPs
163 commercialization to smooth fluctuations in monetary income received by forest dwellers. In
164 two of these cases , both conducted in communities living in natural reserves in India, NTFPs
165 were responsible for increasing income irregularity, mainly because of fluctuations in the

market value of the products traded (Gubbi and MacMillan, 2008; Rai, 2004; Rai and Uhl, 2004). While in one of these communities more than one product was harvested and then sold in more than one form, so diversification of production and trade was in place (Gubbi and MacMillan, 2008), in the other community only one species was harvested and sold as food (Rai and Uhl, 2004). Only one study, reporting on communities of immigrants in the Northwest of the United States, presented evidence that NTFPs may contribute to an increase in the regularity of monetary income levels (Hansis, 1998). The harvested resources and the final product were not specified in the study.

3.2.3 Safety net

Only two cases (3%) addressed the role of NTFPs as safety nets, and both showed that commercialization decreased risks. For instance, in communities of South Africa, the trade of brooms made of the fiber of two NTFP species buffered fluctuations in the levels of income, when other sources of income were unavailable. The most vulnerable households, such as those with many elderly, children or affected by diseases were the ones involved in the broom's trade (Shackleton and Campbell, 2007). The other evidence comes also from South African communities, which in this case harvested various types of NTFPs traded as food, craftworks and medicines. More than 80% of the local households traded or consumed NTFPs in periods of food shortage, or during economic and natural crisis (Shackleton and Shackleton, 2004).

3.3 Effects of NTFP trade to the social capital

188 A total of 26 cases evaluated the effects of NTFP trade to three parameters of social capital:
189 woman empowerment, access to benefits and group cohesion.

190

191 3.3.1 Women's empowerment

192 The effects of NTFP trade to women's empowerment was the most investigated parameter of
193 social capital (half of the total number of cases, i.e.13). Of these cases, 12 reported evidence
194 that NTFP trade was associated with more women's empowerment, while only one reported a
195 decrease in women's empowerment. Positive effects resulted from the opportunities created to
196 women, who gained access to participate in the market economy, despite the low levels of
197 monetary income they were able to raise (e.g. Kainer and Duryea, 1992; Kanmegne and et al.,
198 2007). If we evaluate whether NTFP processing contributes to decrease income inequalities
199 between women and men, we find six cases that present this information, all of them reporting
200 that women were involved in product transformation and thus that processing may help to
201 decrease gender inequalities (e.g. Kainer and Duryea, 1992; Oyerinde, 2008).

202 The only study that reported that NTFP trade was associated with women's disempowerment
203 was conducted in a tribal community in India. In this case, women harvested NTFPs, but men
204 controlled the monetary income from trade. Because of that, women's socioeconomic
205 conditions were unaltered or got worse because of higher workloads (Chandramohan and
206 Villalan, 2008).

207

208 3.3.2 Access to benefits

209 Within the social capital category, approximately one third of the cases (31%) assessed the
210 effects of commercialization to benefit sharing. From these evaluations, 62% reported that

211 trade negatively impacted the access to benefits, while 38% reported the contrary.
212 Nevertheless, empirical evidence is limited to evaluations of benefit access within the
213 financial capital domain. For instance, the literature does not report empirical evidence of
214 whether NTFP trade affects the access to infrastructure or working tools.

215 From the available empirical evidence, five cases report that the monetary income generated
216 by NTFP trade was unequally distributed among individuals within the household, as well
217 amongst households (e.g. Gubbi and MacMillan, 2008; Kusters et al., 2006). The most
218 vulnerable individuals (e.g., elders) or households (e.g., with several children), often had less
219 access to NTFP trade and its benefits (Gubbi and MacMillan, 2008). In some cases, access to
220 the resources became controlled by a few dominant households (Rai and Uhl, 2004). In
221 contrast, three studies found the opposite relationship, i.e. that NTFP trade contributed to
222 decrease inequalities and to promote a better distribution of monetary income (e.g. López and
223 A, 2007)

224

225 3.3.3 Group cohesion

226 About 19% of the studies evaluating the impacts of NTFP to people's social capital reported
227 the effects to the group's cohesion (19%). All the cases that evaluated this parameter found
228 that NTFP trade promotes group cohesion and strengthens social relations within the
229 community (e.g. Doble and Emery, 2000). The positive evidence includes cases in which
230 harvesting was carried out in groups (e.g. Emery, 1999; Morsello, 2002), or in which
231 individuals shared information and knowledge about the occurrence of harvested resources
232 (Doble and Emery, 2000; Emery, 1999). In one of the studies, gifts prepared with the
233 harvested resources or purchased with money from trade have also contributed to strengthen
234 social links (Doble and Emery, 2000).

3.4 Effects of NTFP trade to human capital

Only two cases in our sample empirically evaluated the effects of NTFP trade to parameters of human capital. The available evidence indicated that NTFP trade can strengthen the use of traditional methods of resource harvesting and management and increase communities' access to information (Kusters et al., 2006). Access to information can increase also because people establish contacts with external stakeholders with openness to markets (Kusters et al., 2006).

We did not identify any study that evaluated whether NTFP trade affects people's health, such as promoting nutritional changes, nor we have found evidence of the association between NTFP trade and non-traditional forms of knowledge, such as the access to formal education.

3.4 Effects of NTFP trade to natural capital

Our sample includes only two cases that empirically evaluated the effects of NTFP trade to the following parameters of natural capital: legal control and physical access to the resource. Both are results of a single study of communities living in natural reserves in India who harvest the fruit of a tree species (Rai, 2004). The studie reported that NTFP trade favored harvest legalization, guaranteed land tenure, and provided physical access to the harvested resource to a large number of individuals in the community (Rai, 2004).

3.5 Effects of NTFP trade to physical capital

Only two cases empirically evaluated the effects of NTFP trade to physical capital parameters. One of these focused on effects to the infrastructure and the other the ownership

of working tools and equipments. Both reported improvements, such as improved house constructions, and the acquisition of equipments for harvesting and processing the resource (Kusters et al., 2006).

4. Discussion

Our main result is that the socioeconomic effects of NTFP trade outweighs the negative results. Therefore, our systematic and quantitative evaluation of the empirical evidence of the literature agrees with current views in the literature that NTFP trade is often associated with positive results and bear little risks (e.g. Arnold and Ruiz, 2001).

The current body of knowledge, however, is unbalanced in terms of evaluated aspects. From the different forms of capital which could be evaluated, the great majority studies deal solely with financial capital aspects and, in a smaller proportion, social capital aspects. This trend was nonetheless expected, because NTFP trade as a strategy was promoted under the premise it could increase socioeconomic development through advancing communities' access to markets and monetary income (Arnold and Ruiz, 2001). Only few studies deal with aspects of human capital, natural capital, and physical capital, so we still do not know if NTFP can have positive impacts in a broader range of development indicators, or only to financial capital.

The current evidence supports the view that NTFP trade contributes to raise the monetary income of communities (e.g. Kanmegne and et al., 2007). Moreover, despite income contributions may be low, NTFP income can be the sole source for several people and communities, or it can supplement other sources in locations were access to monetary income is rare (Morsello, 2006).

Despite the fact that we have sufficient evidence showing that NTFP trade contributes to raise monetary income levels, we are yet uninformed about the percentage of this contribution to the total income of the communities. Moreover, studies infrequently report enough information regarding whether products are processed, or the type of NTFP harvested, so we do not know whether some types of products and some strategies add more value to the income received.

A second attribute of income is its regularity, i.e. how much it fluctuates across the year or across different periods. There are two opposing views in the literature as regards whether NTFPs contribute to decrease or increase income fluctuations. The first argues that NTFP trade expands opportunities, so it may regularize income levels across the year (Hansis, 1998). The second proposes that NTFP markets are frequently volatile, and NTFPs are easily substitutable by other goods, so trading NTFPs provides an inherently irregular source of income (Mayers, 2000). The evidence presented in this study shows that the majority of the cases report that NTFP trade is associated with income fluctuations. Despite that, the small number of cases reporting the parameter hinders our possibility to make reliable inferences.

The NTFP literature also frequently report that NTFPs are traditionally used as a safety net in times of crisis and when there are food shortages (Belcher and Schreckenberg, 2007). However, the idea advocated is that when communities start selling the same NTFP, these resources should become scarcer for people's subsistence, therefore increasing people's risks (Belcher and Schreckenberg, 2007; Morsello and Adeger, 2007). The evidence reported in this study, however, do not support this hypothesis. In both cases the activity act as a financial safety net in times of scarce incomes (Shackleton and Shackleton, 2004) but, again, since there are only two empirical studies that report this parameter we are unable to reach strong conclusions.

As regards inequalities between women and men, the literature proposes that NTFP trade can both, increase or decrease women's empowerment. The participation of women can result in a new opportunity to obtain monetary income (Neuman and Hirsch, 2000), but it can also exclude women from the better remunerated steps of NTFP trade, or even negate them the control of the monetary income generated by their own work (Neuman and Hirsch, 2000). For instance, some authors claim that when NTFP processing involves mechanization, men often control the process and the income received (Neuman and Hirsch, 2000). In this regard, the evidence gathered by this study corroborates the first hypothesis (e.g. Kanmegne and et al., 2007; Oyerinde, 2008), and there is only one that supports the second (Chandramohan and Villalan, 2008). This indicates that in most cases NTFP trade is an opportunity, often unique, for women to benefit from the market economy.

There are also contradictory claims in the literature referring to how NTFP trade should impact the access to the benefits generated from the activity. Some authors argue that due to inherent characteristics, NTFP trade does not require a large initial capital investment, and thus the activity may be an opportunity for a wide range of communities and households (Marshall and Newton, 2003b). Other authors suggest that, despite the small barriers to participate in NTFP trade, some households are unable to participate, leading to inequalities and internal disputes in the community (Arnold and Ruiz, 2001; Kusters et al., 2006). The evidence presented in this study and show that the most vulnerable households are also those with less access to NTFP trade and the associated commercialization and its benefits (e.g. Gubbi and MacMillan, 2008). Although in small numbers, there is also evidence showing that the NTFP trade promotes a more equitable distribution of monetary income amongst households (López-Feldman and Wilen, 2007).

Another aspect of social capital that may be impacted by NTFP trade is community cohesion and internal organization. The literature proposes that community cohesion and internal

328 organization can either be strengthened through the encouragement of collective practices and
329 knowledge exchange (Shackleton, 2007), or weakened due to the encouragement of individual
330 practices or the exacerbation of internal conflicts (Wollenberg and Ingles, 1998). The
331 evidence raised in this study supports the hypothesis that NTFP trade can increase group
332 cohesion (e.g. Doble and Emery, 2000). The available evidence comes from contexts in which
333 NTFP harvesting was performed in group, which thus contributed to strengthen social
334 relations (e.g. Emery, 1999; Morsello, 2002). Other factors reported identified as likely to
335 contribute to strengthening social networks were the exchange of gifts among harvesters, and
336 information sharing about the harvested resource and their areas of occurrence (Doble and
337 Emery, 2000).

338 As regards natural capital, the evaluated aspects include the effects of NTFP trade to the
339 physical access and legal control over the resource harvested. There are contradictory
340 arguments in the literature as regards the effects of NTFP trade to the natural capital. In the
341 literature, it is assumed that the commercialization of NTFPs can: (i) promote management
342 practices that lead to both increases or decreases in natural stocks of the harvested resource;
343 (ii) make the resources available to more or to less people in the community (Kusters, 2009;
344 Kusters and Belcher, 2005), and (iii) changes the communities' rights of use and control of
345 NTFPs (Kusters and Belcher, 2005; Newton and et al., 2006). However, evidence in this
346 regard is scarce and therefore conclusions are impossible, since there is only one case that
347 presented evidence that NTFP trade strengthened land tenure and secured the physical access
348 to NTFPs for many households (Rai, 2004). Possibly, the lack of studies is related to the
349 difficulty in establishing a clear causal relationship between NTFP trade and changes in use,
350 or rights of use of the land or of the resource.

351 With respect to the physical capital, the literature suggests that NTFP trade might promote
352 improvements in local infrastructure (Kusters and Belcher, 2005; Newton and et al., 2006).

353 However, there is again absence of evidence to support this view, since this idea comes from
354 a single empirical evidence (Kusters et al., 2006).

355

356 **5. Conclusions and implications**

357 The promotion of NTFP trade as a development and conservation strategy is already more
358 than 30 years old, but this review showed that, despite the ubiquity of the theme in the
359 literature, our knowledge about the socioeconomic effects is still limited to only a few of the
360 socioeconomic aspects. Moreover, several studies do not provide enough information as
361 regards the final product commercialized and the context of the trade.

362 To sum up, we should emphasize that, despite the large number of articles that focus on the
363 socioeconomic effects of NTFP trade, the empirical evidence is poor for most of the evaluated
364 parameters. Moreover, the studies frequently do not present essential information, such as the
365 type of NTFP harvested and, whether it is sold processed or not, or if there is diversification
366 in terms of products harvested and sold, among other important characteristics. Because of
367 that it is difficult, if not impossible, to use the current literature to perform quantitative meta-
368 analysis aimed at evaluating the relationships between some characteristics of NTFP trade and
369 their effects on selected socioeconomic parameters.

370 Despite that, we are as yet able to state that the socioeconomic effects, particularly the
371 financial ones, are most frequently positive. Yet, there are also some negative effects which
372 can reduce local people's well being, indicating a need to implement monitoring practices.
373 These practices should, first, include parameters of the effects to people's financial capital,
374 especially the contribution of NTFP income to the total, and the regularity across the year in
375 the influx of benefits, considering whether NTFP trade contributes to smooth fluctuations in
376 income levels or not. As regards the effects of NTFP trade to the social capital, monitoring

plans should include indicators to assess women's empowerment, group's cohesion and the distribution of the benefits generated by NTFP trade. Although we still lack empirical evidence of the impacts of NTFP trade to aspects of the human, natural and physical capitals, we should monitor these effects because of the drastic consequences to people's well being when trade negatively affects some of these parameters (e.g., health impacts, access to the resource exploited, or to the exploited area).

6. References

Angelsen, A., Wunder, 2003. Exploring the forest poverty link: key concepts, issues and research implications. CIFOR, Bogor.

Arnold, J., Ruiz, P., 2001. Can non-timber forest products match tropical forest conservation and development objectives? Ecological Economics 39, 437-447.

Bebbington, A., 1999. A framework for analyzing peasant viability, rural livelihoods and poverty. Forthcoming in World Development 27, 1-39.

Belcher, B., Schreckenberg, 2007. Commercialization of non-timber forest products: a reality check. Development Policy Review. 25, 355-377.

Brown, K., 2002. Innovations for conservation and development. The Geographical Journal 168, 6-17.

Chandramohan, B., Villalan, 2008. Impact of commercialization on tribal culture and forest ecosystem sustainability, Cheltenham.

Doble, S., Emery, 2000. The role of non timber forest products: a case study of gatherers in the eastern United States. Proceedings of the 2000 northeastern recreation research

399 symposium. USDA forest service general technical report northeastern forest experimental
400 station 276, 53-57.

401 Emery, M., 1999. Non-timber forest products and livelihoods in Michigan's Upper Peninsula.
402 Forest communities in the third millennium: linking research, business and policy toward a
403 sustainable non-timber forest product sector. USDA forest service general technical report
404 north central 217, 23-30.

405 Gubbi, S., MacMillan, 2008. Can non-timber forest products solve livelihood problems? A
406 case study from Perivar Tiger Reserve, India. Oryx 42, 222-228.

407 Hansis, R., 1998. A political ecology of picking: non-timber forest products in the Pacific
408 Northwest. Human Ecology 26, 67-86.

409 Kainer, K., Duryea, 1992. Tapping women's knowledge: plant resource use in extractive
410 reserves, Acre, Brazil. Economic Botany 46, 408-425.

411 Kanmegne, J., et al., 2007. Gender analysis in the commercialization of Gnetum
412 africanim/buchholzuanum in the Lékié division in Cameroon. Journal of Food Agriculture
413 and Environment 5, 243-247.

414 Kusters, K., 2009. Non-timber Forest product trade: A trade-off between conservation and
415 development. Assessing the outcomes of non-timber forest product trade on livelihoods and
416 the environment, with special emphasis on the damar agroforests in Sumatra, Indonesia.
417 Universiteit van Amsterdan.

418 Kusters, K., Achdiawan, R., Belcher, B., Ruiz, P., M., 2006. Balancing development and
419 conservation? An assessment of livelihood and environmental outcomes of nontimber forest
420 products in Asia, Africa, and Latin America. Ecology and Society 11, art. 20-art. 20.

421 Kusters, K., Belcher, 2005. A method to assess the outcomes of forest product trade on
422 livelihoods and the environment. CIFOR Working Paper 32, 1-32.

423 López-Feldman, A., Wilen, J., 2007. Does natural resource extraction mitigate poverty and
424 inequality? Evidence from rural Mexico and Lacandona rainforest community. Environment
425 and Development Economics 12, 251-269.

426 López, F., A, M., 2007. Does natural resource extraction mitigate poverty and inequality?
427 Evidence from rural Mexico and Lacandona rainforest community. Environment and
428 Development Economics 12, 251-269.

429 Marshall, E., Newton, 2003a. Commercialization of non-timber forest products: first steps in
430 analyzing the factors influencing success. International Forestry Review 2, 128-137.

431 Marshall, E., Newton, 2003b. Non-timber forest products in the community of El Terrero,
432 Sierra de Manantlán Biosphere Reserve, Mexico: is their use sustainable? Economic Botany
433 57, 262-278.

434 Mayers, J., 2000. Company-community forestry partnerships: a growing phenomenon.
435 Unasylva 51, 33-41.

436 Morsello, C., 2002. Market integration and sustainability in Amazonia indigeneous
437 livelihoods: The case of the Kayapó. School of environmental sciences of the University of
438 East Anglia, East Anglia.

439 Morsello, C., 2006. Company-community non-timber forest product deals in the Brazilian
440 Amazon: A review of opportunities and problems. Forest Policy and Economics 8, 485-494.

441 Morsello, C., Adeger, 2007. Do Partnerships between large corporations and Amazonian
442 indigenous groups help or hinder communities and forests?, in: Ros-Tonen, M., Hombergh

443 (Eds.), Partnerships in Sustainable Forest Resource Management: Learning from Latin
444 America. Brill, Amsterdam, pp. 91-104.

445 Neuman, R., Hirsch, 2000. Commercialization of non-timber forest products: a review and
446 analysis of research. CIFOR, Bogor.

447 Newton, A., et al., 2006. Use of Bayesian belief network to predict the impacts of
448 commercializing non-timber Forest products on livelihoods. Ecology and Society 11, art.24-
449 art.24.

450 Oyerinde, O., 2008. Potentials of common property resources in a Nigerian rainforest
451 ecosystem: an antidote to rural poverty among women, Cheltenham, pp. 9-9.

452 Rai, N., 2004. The socio economic and ecological impact of Garcinia gummi-gutta fruit
453 harvest in the Western Ghats, India, in: Kusters, K. (Ed.), Forest products livelihoods and
454 conservation. Case studies on non-timber forest product systems. Volume 1 – Asia. CIFOR,
455 Bogor, pp. 23-41.

456 Rai, N., Uhl, 2004. Forest product use, conservation and livelihoods: the case of uppage fruit
457 harvest in the Western Ghats, India. Conservation and Society 2, 289-313.

458 Ros-Tonen, M., 2000. The role of non-timber forest products in sustainable tropical forest
459 management. Holz als Roh-und Werkstoff 58, 196-201.

460 Setty, R., Bawa, 2008. Evaluation of a participatory resource monitoring system for
461 nontimber forest products: the case of Amla (Phyllanthus spp.) fruit harvest by Soligas in
462 South India. Ecology and Society 13, art.19-art.19.

463 Shackleton, C., 2007. The importance of dry woodlands and forests in rural livelihoods and
464 poverty alleviation in South Africa. Forest policy and economics 9, 558-577.

Shackleton, C., Shackleton, 2004. The importance of non-timber forest products in rural livelihood security and as safety nets : a review of evidence from South Africa. South African Journal of Science 100, 658-664,-658-664.

Shackleton, S., Campbell, 2007. The traditional broom trade in the Bushbuckridge, South Africa: helping poor women cope with adversity. Economic Botany 61, 256-268.

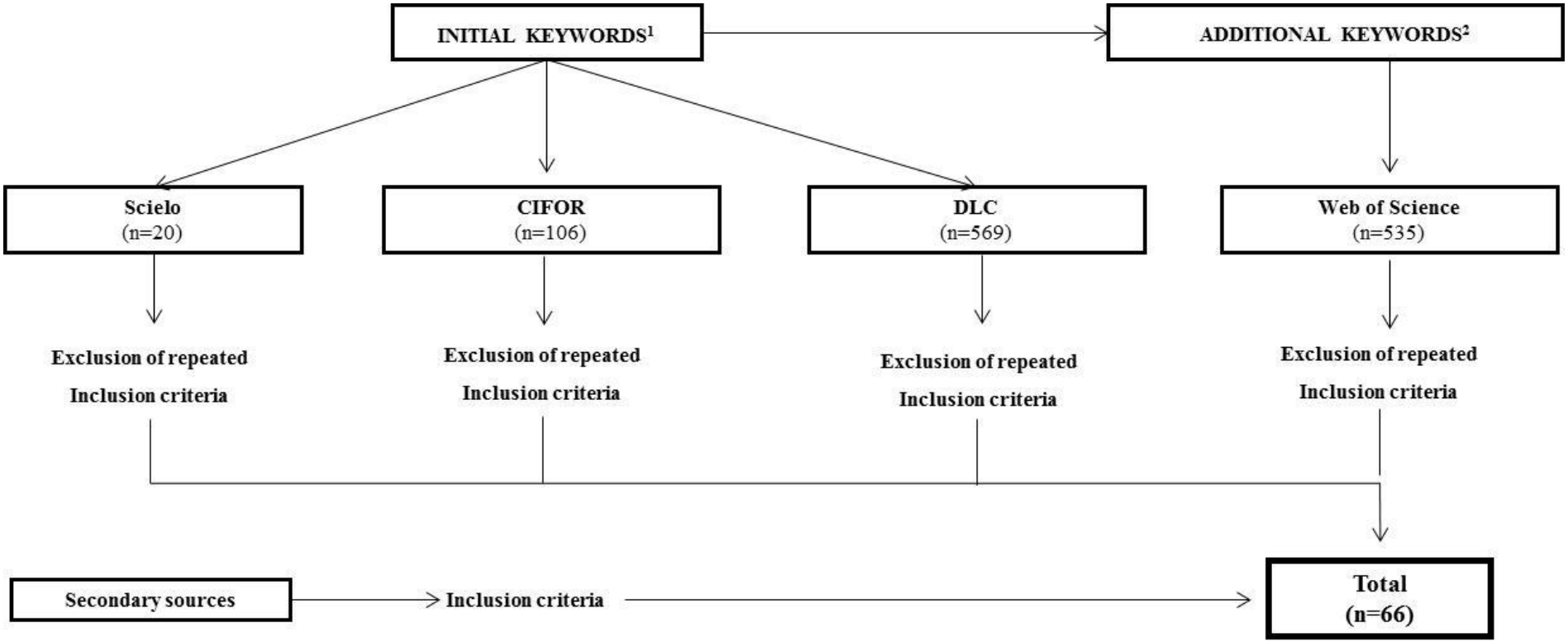
Sola, P., 2004. Pal utilization for basketry in Xini Ward, Sengwe communal areas, Zimbabwe, in: Sunderland, T., Ndoye (Eds.), Forest products, livelihoods and conservation. Case studies of non-timber forest product systems. Volume 2 - Africa. CIFOR, Bogor, pp. 245-262.

Wickramasingh, K., Steele, 2008. Socio-economic impacts of forest conservation on peripheral communities: case of knuckles national wilderness heritage of Sri Lanka, Cheltenham, pp. 15-15.

Wollenberg, E., Ingles, 1998. Incomes from the forest: methods for the development and conservation of forest products for local communities. CIFOR and IUCN, Bogor, pp. 234-234.

481 **Figure 1.** Schematic plan of the search strategies

482



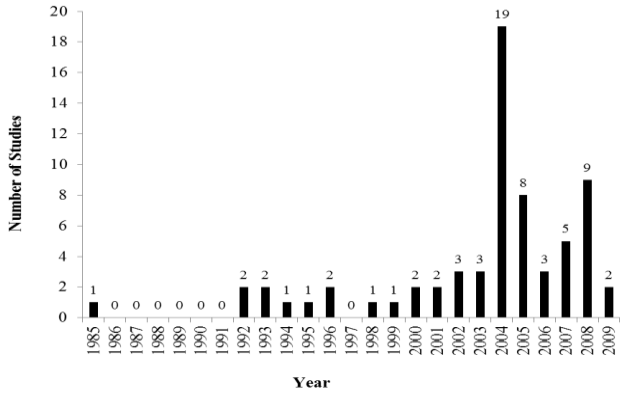
[1] "non timber", "nontimber", "nonwood", "non-timber", "non wood" and "non- wood"

[2] (plant AND Forest) AND (commer* AND harvest*); (seed AND Forest) AND (commer* AND harvest*); (fruit AND Forest) AND (commer* AND harvest*); (leaf OR leaves) AND (forest) AND (commer* AND harvest*); (flower* AND Forest) AND (commer* AND harvest).

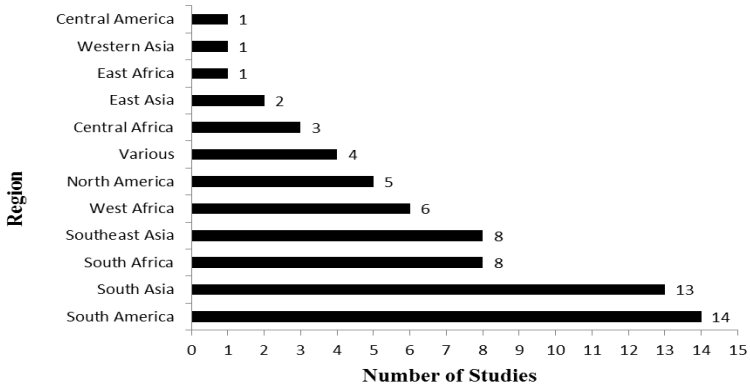
Table 1. Socioeconomic parameters evaluated and possible effects of NTFP commercialization.

Capital	Parameter	Effect	References[1]
Financial	**Monetary income**	Increase or decrease of the monetary income of the household or community	(NH; BS; K; FD. MNS)
	Regularity of monetary income	Changes in the monetary income input	(BS; K)
	Safety net	Changes in the role of safety net of the NTFP Comercialização altera o papel do PFNM como "salvaguarda" (*safety net*) in times of food or income shortages	(K)
Social	**Women empowerment**	Changes in the empowerment, e.g., power of decision, action and monetary income of women	(NH; N; MNS)
	Group cohesion	Changes in the group cohesion or on the social relations in the community	(K)
	Political power	Power, influence and political organization against external actors or institutions	(K)
	Access to benefits	Equal access to the benefits generated by the trade, such cash income and infrastructure	(NH; K**;** FD; MNS)
Human	**Health**	Changes in the health or nutrition	(N; K)
	Traditional knowledge and practices	Changes in the use or transmission of traditional knowledge or on the time allocation to the traditional practices of the community	(N; K)
	Non-traditional knowledge	Changes in the formal education or other kinds of education that are not part of the traditions of the community	(BS; K)
	Access to information	Changes in the access to information	(N; K)
Natural	**Physical access**	Changes in the resource management that can lead to an increase or a decrease in the natural stock and made it available to a greater or lesser number of member of the community	(K)
	Legal control	Changes in the rights or in the access to the land or to the harvested resource	(NH; N; K)
Physical	**Infrastructure**	Changes in the access to infrastructure or improvements such as houses, roads, transportations and communication	(N; K)
	Tools and equipments	Changes in the possession of equipments and tools for the harvest or processing of the harvested resources	(N; K)

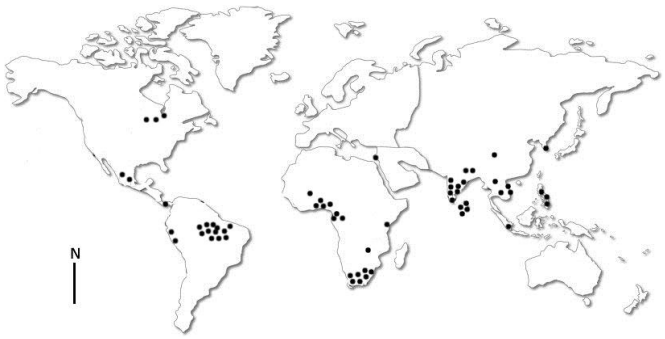
Notes: (1) Belcher and Schreckenberg, 2007 (BS); Fisher and Dechaineux, 1998 (FD); Kusters, 2009 (K); Marshall et al., 2003 (MNS); Neumann and Hirsch, 2000 (NH); Newton et al., 2006 (N).



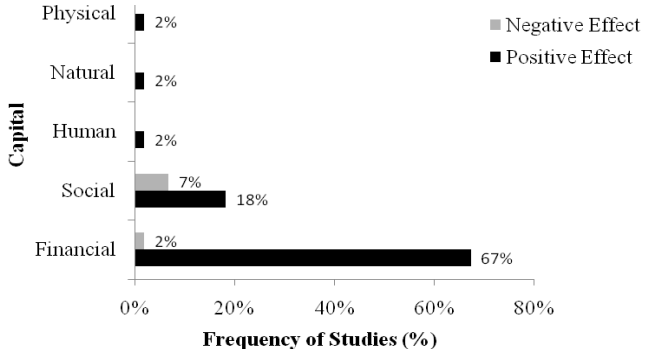
(2a) Number of studies by year (1985-2009)



(2b) Number of studies by region of the world



(2c) Geographical distribution of the studies



(2d) Frequency of studies by capital and type of effect

Figure 2. Characteristics of the studies incorporated in the review (n=66)