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Non-timber forest product extraction as a productive bricolage process

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Abstract

This chapter explores the usefulness of the 'productive bricolage' concept, coined by Croll and Parkin (1992) and further elaborated by Batterbury (2001), in understanding the role of non-timber forest products (NTFPs) in people's livelihoods and the forested landscape. I argue that NTFP extraction as part of a productive bricolage process – defined as 'the flexible and dynamic crafting together of various livelihood options and its associated impacts on the landscape' – holds limited potential for poverty alleviation as it is mostly a sign of economic precariousness. Regarding the impact of NTFPs production on the landscape, I demonstrate that the productive bricolage concept is useful for reinterpreting Wiersum's writings on the evolutionary continuum of forest–people interactions and the co-domestication of forests and trees. However, a more encompassing approach is needed considering the decreasing autonomy of community forestry and the growing integration of NTFP production into commercial networks and multilevel governance regimes. I propose political ecology as the overall perspective to deal with such multiscalar influences.

Keywords*:* non-timber forest products, productive bricolage, political ecology, livelihood diversification, scale

Introduction

Since the end of the 1980s, it has become widely acknowledged that forests not only provide valuable timber, but also a large variety of non-timber forest products (NTFPs), such as food, fodder, medicines, construction materials and tools (for reviews, see Belcher *et al.*, 2005; Neumann and Hirsch, 2000; Ros-Tonen and Wiersum 2005). These products comprise plant and animal products for subsistence and trade from forested landscapes, including human-modified ones (Ros-Tonen, 2000; Ros-Tonen and Wiersum, 2005). Firewood is usually excluded from the definition of NTFPs as it does not fit the conservation paradigm very well, although several developing countries include fuel wood in the definition of NTFPs in national legislation (Ingram, pers. comm.; see the chapter by Jolien Schure in this volume for a more extensive discussion on the inclusion of fuel wood in the definition of NTFPs). It has become increasingly clear that forests provide multiple livelihood assets, not only productive, but also religious, spiritual and cultural (Cocks and Wiersum, 2003; Cocks *et al.*, 2011). It is now common wisdom that forest-based livelihood activities usually form part of complex livelihood strategies consisting of multiple components. Due to seasonality and the low densities in which non-timber forest products generally occur, forest-based livelihoods rarely

involve specialised full-time activities, but are usually combined with other economic activities (Ros-Tonen and Wiersum, 2005; Wiersum, 1999).

In this chapter, I explore whether the 'productive bricolage' concept, coined by Croll and Parkin (1992) and further elaborated by Batterbury (2001), is useful for understanding the role of NTFPs in people's livelihoods and the forested landscape. Here this concept is understood as 'the flexible and dynamic crafting together of various livelihood options and its associated impacts on the landscape'. I argue that NTFP extraction as part of a productive bricolage process holds limited potential for poverty alleviation because productive bricolage, as Ellis (2000) has stated for livelihood diversification, is a sign of economic precariousness. Regarding the impact of NTFP production on the landscape, I will demonstrate that the productive bricolage concept is useful for reinterpreting Wiersum's writings on the evolutionary continuum of forest–people interactions (Wiersum, 1997a) and the co-domestication of forests and trees (Wiersum, 1997b), but that the decreasing autonomy of community forest management (Wiersum, 2009) and the growing integration of NTFP production into commercial networks and multilevel governance regimes (Ros-Tonen and Wiersum, 2005; Wiersum 2009) require a more encompassing approach. To take such multiscalar influences into account I propose political ecology – labelled 'environmental political geography' by Dietz (1999) – as the overall perspective. The idea of using the productive bricolage concept as part of a political ecological analysis of livelihood and landscape dynamics is not new and was proposed by Simon Batterbury in his article on livelihood diversification in southwestern Niger (Batterbury, 2001). However, as I will show, the concept has hardly been adopted in the NTFP literature.

First, I outline some general characteristics of NTFP production and its contribution to livelihoods, before introducing the concept of productive bricolage and how it relates to, but also differs from, the concept of livelihood diversification. I then elaborate on how cross-scale and multilevel interactions impact on people's livelihoods and consequently on the landscape. I conclude by integrating these ideas into an analytical framework for the study of NTFP production systems.

Non-timber forest products: General characteristics and their role in peoples' livelihoods

A large number of studies and reviews carried out during the past two decades (e.g. Belcher *et al.*, 2005; Kusters *et al.*, 2006; Neumann and Hirsch, 2000; Ros-Tonen and Wiersum 2005; Vedeld *et al.*, 2007) provide insight into how NTFPs are used worldwide. The use patterns are remarkably similar across the world. On all continents, people in remote areas use a considerable number of plant species for subsistence, with over five hundred different species being no exception. With over 50% of the species being used for medicinal purposes (Van Andel, 2000; Van Dijk, 1999), wild medicines rank first in subsistence use, but lower in terms of their share in cash income (6.9 % in the study by Vedel *et al.*, 2007). Animal species – fish and game – are important sources of protein, while hunting for and eating bushmeat are also culturally important activities (Davies and Brown, 2007; Demmer and Overman, 2001; Van Vliet *et al.*, 2011). Even when people migrate to cities, bushmeat continues to be a favourite food item, particularly in Africa. Comparative research indicates wild foods, fuel wood and fodder to be the main sources of income from forests (Vedeld *et al.*, 2007). Whether it is classified as an NTFP or not, fuel wood is the most important forest product worldwide According to a CIFOR study encompassing 8,000 households from 60 sites in 24 countries,

fuel wood contributes 20% of forest income on average (press release, CIFOR Poverty and Environment Network (PEN), September 2011). The general tendency is that the poorest consume relatively more forest products than people who are better off. These products can be considered 'gap fillers' that complement farm produce, both qualitatively (complementary food items) and quantitatively (a fall-back during the slack season) (Sunderlin *et al.*, 2005).

Table 1. Non-timber forest products and their uses

Products category	**Examples**
A. Plant products	
Food	Edible plants and plant parts (seeds, roots, tubers, stems, leaves, shoots, flowers, fruits, nuts) providing vegetables, snacks, beverages, edible fats and oils, spices, flavourings, etc.
Forage	Plants used as food for livestock and wildlife
Medicinal products	Medicinal herbs, plants, and plant parts (leaves, bark, etc.)
Construction materials	Bamboo, rattan, smallwood, fibbers, cork, leaves for roofing (roof thatch)
Utensils	Smallwood for handicrafts and tools, leaves for wrapping food, fibbers for basketry and cloths
Biochemicals	Inedible fats and oils, waxes, gums, latex, dyes, tannins, biochemicals for plastics and coatings, paints and varnish, toxins for hunting, hallucinogens
Aromatics	Essential oils for cosmetics, perfumes and incense
Ornamentals	Aesthetically pleasing plants, cut and dried flowers
B. Animal products	
Food	Meat and protein from mammals, birds, fishes, reptiles and insects, eggs, edible nests, honey
Forage	Fish oil, bones
Medicinal products	Pharmaceuticals extracted from mammals, fish and reptiles
Utensils	Horn, feathers, bones
Biochemicals	Wax, silk, propolis, guano, toxins
Ornamentals	Live animals and animal products like feathers, hides, skins, shells and horn

Source: Adapted from FAO (1991), excluding fuel wood

Gathering NTFPs tends to be replaced by other activities once alternative options become available (e.g. Dove, 1993; Godoy and Bawa, 1993). Exceptions to this are some specialised and culturally important activities, such as hunting, handicraft making and the extraction of products for stable external markets, including those for specialty food like edible birds' nests, certain ginseng roots and exclusive mushrooms (Kusters and Belcher, 2004) and products in high-value trade, such as Brazil nuts, damar resin and *Prunus africana* (Kusters *et al.*, 2006). This results in a diversified picture of the importance of NTFPs for people's livelihoods, with access to markets being the main determining factor. Belcher *et al.* (2005) grouped them as follows:

- *Subsistence*: Households extract low-value products like palm fibres, canes and grasses for tools and thatching as well as medicinal plants from forests and fallows, and process and use these mainly within the household for their own use. Income from NTFPs in this

group is less than 50% of the household's total income (cash and subsistence), but it is their main or only source of cash income.

- *Supplementary*: Households extract fruits and medicinal plants from the wild for local processing, consumption or the regional market. Households in this group receive more than half of their income in cash, but less than 50% from NTFPs.
- *Integrated*: Households cultivate NTFPs or manage them intensively in a limited area and process them locally to sell on local and domestic markets. Examples of products in this group are bamboo, high-value wood carvings, fruits and resin. As is the case in the supplementary group, these households earn a large proportion of their income in cash from a combination of farming, off-farm activities and NTFP production, with the last providing less than 50% of their household income.
- *Specialised-natural*: Households exploit high-value food items and medicinal plants from the wild for national and international markets. This generates more than 50% of their income, which is at an intermediate level.
- *Specialised-cultivated*: Households cultivate and intensively manage specialty food products, resins and dyes for international markets, which provide them with incomes higher than the local average, with more than 50% derived from NTFPs.

The processing technologies employed in NTFP production are generally perceived to be simple. This is true for such products as Brazil nuts, basketry and rattan furniture, but Belcher and Schreckenberg (2007) note that some NTFPs used in medicines or vegetable oil require processing in very sophisticated laboratories.

A lively debate has evolved around the potential of NTFPs to contribute to conservation and development aims since Peters *et al.* (1989) and De Beer and McDermott (1989) put the term on the research agenda. The underlying reasoning of such a strategy is that local authorities and forest resource managers will have an interest in preventing indiscriminate forest use or the conversion of forest to other land uses when NTFP extraction contributes to the gross national product (GNP) and export earnings. As far as local communities are concerned, increased income from the trade in NTFPs was thought to provide a stimulus for protecting their forests and managing them sustainably. Since it was assumed that many NTFPs can be harvested without significantly altering the forest structure, their exploitation was expected to maintain the forest's environmental services and biological diversity (Peters *et al.*, 1989). All these factors have led to the notion that the commercial extraction of NTFPs would be a potentially sound conservation strategy, while also contributing to local development (Ros-Tonen *et al*., 1995; Ros-Tonen, 2000). In Brazil, in particular, NTFPs like rubber and Brazil nuts also became a symbol of rubber tappers' struggle for the demarcation of extractive reserves to continue a sustainable forest-based way of life, protected from claims by cattle ranchers and other actors to forest land (Allegretti, 1990).

Three major changes can be observed in the NTFP debate since then. First, the discussion has extended beyond natural tropical rain forests to include products from semi-arid areas and human-modified vegetation types like forest gardens and agroforestry systems (Ros-Tonen and Wiersum, 2005; Wiersum and Shackleton, 2005). One of the reasons is that NTFP exploitation is economically more feasible in anthropogenic (human-made) forests where product density is higher (Wiersum, 1999), as a result of which livelihood outcomes of NTFP production in these systems are better (Kusters *et al.*, 2006). Second, recent literature refutes the claims that NTFP extraction is environmentally benign, as even local and regional trade can lead to overexploitation and extinction (Clark and Sunderland, 2004). Third, recent insights also make it clear that NTFPs are indeed an important safety net for poor forest-

dwelling people, but have little potential to lift people out of poverty (Belcher *et al.*, 2005; Kusters *et al.*, 2006; Vedeld *et al.*, 2007). A lack of storage and processing facilities, bad roads and high transportation costs hinder the trading of NTFPs, especially in isolated areas. Consequently, perishable products in particular have to be consumed locally.

Due to the seasonality and unpredictability of production cycles, the low densities of products in the wild and their wide distribution mean volumes are low and supplies irregular. Markets are also fragmented because NTFPs provide input to a wide range of industries, including food and beverages, pharmaceuticals, cosmetics and botanical medicines. Producers often face the difficulty of meeting international quality standards prevalent on these markets, and these are also subject to trends and therefore changeable. All this, combined with a lack of organisation among harvesters, often makes NTFP producers dependent on intermediaries and subject to exploitative production and trading relations (Ros-Tonen, 2000). As a result, the contribution of commercial NTFPs to poverty alleviation is generally limited. Even the products in the 'specialised' group (e.g. Brazil nuts (*Bertolletia excelsa*) harvested from the wild in Bolivia, Brazil and Peru, or damar resin, harvested from complex agroforests in Indonesia), which generate incomes that are relatively higher than local averages, are still not high in absolute terms (Belcher *et al.*, 2005). NTFP extraction alone is rarely sufficient to build a secure livelihood. The productive bricolage concept that I introduce in the next section can help with understanding the role of NTFPs in people's efforts to maintain their livelihoods.

NTFP production as productive bricolage

The term 'bricolage' is primarily known in studies on theories of natural resource governance thanks to Frances Cleaver (2002), who proposed the concept to understand the dynamic, ad hoc and flexible nature of building and reconstructing institutions. Drawing on Douglas (1973), who extended Levi-Stauss' concept of 'intellectual bricolage' to institutional thinking, and Ostrom's (1992) notion of 'institutional design and crafting' as a deliberate process of selecting institutional mechanisms for a particular purpose, Cleaver (2002, p. 15) perceives bricolage as an evolutionary process in which institutions of cooperation are embedded in everyday relations, networks of reciprocity and the negotiation of cultural norms. Unlike Ostrom, she does not perceive this process as one of 'conscious selection of mechanisms fit for the collective action task', but as 'a messier process of piecing together shaped by individuals acting within the bounds of circumstantial constraint'. De Koning (2011) applied this concept to NTFP contexts but, like Cleaver, also with a focus on institutions. To my knowledge, the concept has not been applied in the NTFP literature to study the interplay between livelihoods, natural resource use and forested landscapes in an integrated way as proposed by Batterbury (2001).

The bricolage concept first appeared in association with livelihoods in the work of Croll and Parkin (cited in Batterbury, 2001), who coined the concept of 'productive bricolage' to refer to 'tasks over which agents see themselves as having some control, as distinct from work controlled by others outside the home' (*Ibid*., p.12). One of the first authors (and as far as I was able to identify, the only one) who employed this concept in relation to NTFPs was Clare Madge (1994) in her study of collected food and domestic knowledge in The Gambia. The publication went largely unnoticed in the NTFP literature, as she does not use the term NTFP and theoretically linked her study to indigenous knowledge and gender studies of the 1980s and early 1990s. Madge showed that rural households in The Gambia 'follow a seasonal and

adaptable survival plan' in which 'various activities are combined to produce an integrated, flexible strategy' (Madge, 1994, p. 282). She showed that the use of collected food items had increased to cope with reduced rainfall and associated crop failures, and that some collected food items tended to replace cultivated ones in times of labour shortage because they required less cooking time. Women who had experienced severe drought periods had learned to innovate with collected food items, which in that context was therefore referred to as 'famine food' (*Ibid.*, p. 287).

Similarly, Batterbury (2001) draws on the productive bricolage concept to analyse how rural people in Niger have constructed livelihoods in a 'fluid, non-linear, and dynamic process' (*Ibid*., p. 437) in response to local constraints and opportunities, and income-generating possibilities elsewhere. Scoones (2009), although not elaborating on it to a great extent, uses the bricolage concept as a synonym for 'portfolio' to understand the dynamics of economic diversification from local perspectives.

Based on these definitions, I define productive bricolage as 'the flexible and dynamic crafting together of various livelihood options and its associated impacts on the landscape'. This definition is narrowly related to, but also different from, the livelihood diversification concept put forward by Ellis (1998, 2000), which is much more common in the NTFP literature. Ellis (1998, p. 4) defined livelihood diversification as 'The process by which rural families construct a diverse portfolio of activities and social support capabilities in their struggle for survival and in order to improve their standard of living'. This comprises cash and non-cash income as well as the social institutions (kin, family, compound, village, etc.), gender relations and property rights required to build and sustain a livelihood. Access to social services such as healthcare, water supply and education is also part of this process. Stressing that livelihood diversification is a sign of the 'precariousness' of rural livelihoods, Ellis (2000) elaborates on six factors that help to explain households' engagement in multiple livelihoods. These are seasonality, risk mitigation, labour markets, thin credit markets, asset strategies (investments in future livelihood security) and coping behaviour. The last is related to 'diversification by necessity', whereas responding to labour market opportunities by migration and investing in assets for the future (e.g. social networks or trees that can be harvested in the future) are examples of 'diversification by choice'. Overall, livelihood diversification is directed towards reducing income variability within and between years, to prevent overall income failure and improve livelihood security.

This conceptualisation of livelihood diversification is frequently echoed in the NTFP literature in notions like 'safety net' and 'gap filling', which indicate the role of NTFPs in coping strategies (mainly in the subsistence group distinguished above). Also, the livelihoods in 'supplementary' and 'diversified' groups reflect the strategies adopted by families that do not 'put all their eggs into one basket' (Ellis, 2000, p. 294). In the words of Belcher *et al.* (2005, p. 1444–1445):

> 'NTFPs must be considered in terms of systems – people use them in various ways, but most often in combination with other economic activities (…) Using various NTFPs in an economic portfolio (…) allows households to spread risk and to modulate the timing of income (…) Diversification also allows households to balance seasonal labor requirements.'

Why then use the 'productive bricolage' concept to analyse the role of NTFPs in livelihoods? In my view, the attractiveness of the productive bricolage concept lies in its consideration of the interaction between livelihood activities and changes in the landscape. This is an important issue in NTFP studies, which are still strongly driven by the wish to combine

development and conservation goals. Ellis (1998) acknowledges the importance of the physical environment in determining the options for diversification, but mainly in terms of constraints (e.g. access to land or availability of resources). Batterbury (2001), in contrast, argues that livelihood activities themselves are important drivers of change in the landscape. In other words:

> 'The point here is that the intentional mix, or bricolage of agriculture, migration, livestock, and market trading are imprinted in the local landscape, and particularly in land cover' (Batterbury, 2001, p. 452).

Erosion caused by the intensification of farming activities is one example, but also the extension of woodland cover and creation of peri-village forest patches in Western Africa (Fairhead and Leach, 1996, 1998). Productive bricolage thus plays a major role in the forms and dynamics of landscapes. According to Batterbury, landscapes can therefore not be understood without an analysis of livelihood dynamics and decisions about everyday resource use at the local level.

This is also acknowledged by Giannecchini *et al.* (2007), who analysed historical patterns in land-cover change in three villages in a former Bantustan region in South Africa between 1974 and 1997. In general, land-cover change in the region was the combined outcome of socioeconomic dynamics (e.g. the weakening control by traditional authorities over natural resource use since the dismantling of Apartheid, the influx of migrants and resulting expansion of cropland, and increasing exploitation of natural resources such as fuel wood by outsiders) and environmental dynamics (such as rainfall fluctuations and periodic droughts). Interestingly, despite their proximity and comparable biophysical settings, and the similar national and international contexts, the three villages showed dissimilar trends in land-cover change due to site-specific and intra-household differences in livelihood diversification. Productive bricolage thus results in heterogeneous landscape mosaics (*Ibid.*, p. 27). Examples are the depletion of woodlands and certain shrubs and trees around the village as a result of a growing number of households engaging in the trade in fuel wood (Batterbury, 2001), and increasing soil erosion in plots further away from the village when temporary labour migration forces households to allocate scarce labour and organic fertilisation primarily to the plots located closest to the village (Giannecchini *et al.*, 2007).

Madge (1994) is less explicit about the interaction between bricolage and the landscape as her focus is more on women's knowledge of food collection, storage and preservation techniques. Yet she points to the fact that the vegetation types involved in food collection (e.g. mangrove swamps, uncultivated swamps, fallow areas, closed woodland and public spaces in villages), as well as rivers and the sea, form a 'bricolage' in themselves, with some 'wild' food items being 'collected from cultivated fields, while crops are often grown in an agroforestry complex' (*Ibid.*, p. 292). She thus challenges the dichotomy between 'wild' and 'cultivated' food items, as Wiersum did when he coined the concepts of 'evolutionary continuum in forest–people interactions' (Wiersum, 1997a), the 'co-domestication of forests and trees' (Wiersum, 1997b) and 'intermediate land-use systems and multifunctional landscapes' (Wiersum, 2004).

Although Wiersum does not use the productive bricolage concept, his work can be used to shed further light on how the NTFP component in productive bricolage processes impacts on the landscape. In his article on indigenous exploitation and management, Wiersum (1997a) stressed that people living in and near forests are active forest managers who purposively

modify the landscape to safeguard the availability of valuable forest resources. He says of this process (Wiersum, 1997a, p. 3):

> 'The protection and purposeful regeneration of useful species does not necessarily involve the transformation into an agricultural landscape, but may result (…) in a mosaic of managed forests and agricultural systems.'

Based on this statement, he presents a continuum adapted from Harris (1989) that goes from uncontrolled procurement of wild tree products via protection and controlled utilisation to purposeful regeneration of wild trees and, ultimately, the cultivation of domesticated trees in crop plantations. This is reflected in the landscape as a 'gradual transformation of the natural forest into an agro-ecosystem' (*Ibid.*, p. 11) – not as a sequential and unidirectional process, but one in which different phases can coexist. The domestication of trees can also occur in the forest by changing a 'wild' forest into a managed one in which the growth and productivity of preferred trees are enhanced (Wiersum, 1997b). The resulting modalities include (1) protected natural forests (sacred groves, watershed protection forests, clan/village forests), (2) resource-enriched native forests (including enriched fallows), (3) reconstructed forests (forest gardens, planted temple forests, fortification fallows), and (4) mixed arboriculture (home gardens and mixed smallholder plantations). The place of NTFPs in these forest/tree management systems is illustrated in Table 2.

Table 2. NTFP production systems as reflected in the landscape

A. **(Modified) forests with predominantly tolerant[a] forest management practices**
1. Gathering of non-timber products in natural forests in which NTFPs are protected: specific areas or specific tree species in natural forests that are favoured and protected because of their value for providing useful materials. Example: individually claimed trees.
2. Resource-enriched natural forests: natural forests, either old-growth or fallow vegetation, whose composition has been altered by selective protection and incidental or purposeful propagule dispersion of food and/or commercial species. Examples: enriched natural forests; enriched fallows.
B. **Transformed forests with predominantly intrusive[a] forest management practices**
1. Reconstructed natural forests: cultivated and semi-cultivated forest stands with several planted useful species, tolerated or encouraged wild species of lesser value, and non-tree plants (herbs, lianas) composed mainly of wild species. Example: forest gardens.
2. Mixed arboriculture: cultivated mixed stands, almost exclusively of planted, and often domesticated, tree species. Examples: home gardens; smallholder plantations.
3. Interstitial trees on croplands: either naturally regenerated or protected trees, or planted and sometimes domesticated trees scattered over agricultural fields. Example: scattered fruit trees cultivation on/along crop fields.
4. Commercial plantations with associated agroforestry practices: plantations of domesticated tree crops which are (temporarily) intercropped with food plants or grazed by livestock. Example: (mixed) tree crop plantations.

[a] The distinction between forest-tolerant management practices (by which the native vegetation is largely conserved) and forest-intrusive management practices (by which the native vegetation is replaced by (mixed) tree plantations) comes from Anderson (1990).
Source: Wiersum, 1999.

All the NTFP production systems listed in Table 2 are part of productive bricolage processes that result in diversified livelihoods in which people combine the collection of NTFPs with the cultivation of food crops, livestock rearing and/or other economic activities. The classification also illustrates how the NTFP component of productive bricolage processes may impact on the landscape. These characteristics have been integrated in Figure 1, which shows that NTFP extraction and/or cultivation is an integral part of an agroecological system that is based on the crafting together of different economic activities, including extraction, farming and livestock rearing. In addition, the livelihood system includes cash income largely acquired outside the agroecological system, through off-farm and non-farm income (locally or through migration), social provisions and remittances, and – for those who manage to invest in land and physical capital – rent. The NTFP production system manifests itself in the landscape as a bricolage process as well, with NTFPs being collected from various vegetation systems as distinguished by Wiersum (1997a, 1999), ranging from natural forest via modified forests to domesticated NTFPs in agroforestry and farming systems (see also Michon, 2007 for a rich collection of illustrative cases in Southeast Asia). Similar evolutionary domestication processes have been described for animals (e.g. Peterson *et al.*, 2005; Posey, 1985). Here too, the domestication of species occurs as a gradual process that starts with manipulating wildlife and fish densities through watering (in the case of wildlife) and feeding (directly and/or by planting species that attract game and fish) and evolves via fencing to captive breeding of livestock and smallstock, and aquaculture.

[Figure 1 here]

Despite the similarities between Table 2 and Figure 1, Wiersum's approach differs from the productive bricolage literature in stressing human creativity in the reconstruction of landscapes, rather than the need to adapt to the dynamics of climate change, deforestation and/or changes in the socioeconomic and political sphere. Wiersum's analysis thus corresponds with what Ellis (1998) labels 'diversification by choice', whereas productive bricolage is the combined effect of 'diversification by choice' and 'diversification by necessity'. Therefore, a more encompassing approach is needed for a better understanding of the drivers behind decisions about livelihood strategies and natural resource use, also considering the growing complexity of the entrenchment of natural resource management in multiscalar and multilevel frameworks. This issue will be addressed in the next section.

The need to consider levels of scale: Adding a political ecological perspective

Considering global environmental change and the increasing integration of local resource use systems into broader economic and governance networks (Ros-Tonen and Wiersum, 2005; Wiersum, 2009), a local-level analysis of resource use and productive bricolage fails to adequately explain landscape dynamics. Multiscalar influences of different kinds (e.g. geographical, temporal and/or institutional) should be taken into account. Batterbury (2001) acknowledges this and proposes such an analysis from a political ecological perspective as a bridging framework to explain landscape features as the result of various processes operating at different scales and with different underlying forces.

Political ecology became popular, particularly among human geographers, as an approach to analysing the politics of human interaction with the environment. Inspired by neo-Marxism, the early political ecological literature (Blakie, 1985; Watts, 1983) focused mainly on uneven access to natural resources to explain the socioeconomic vulnerability of rural people and the

resulting environmental impacts. But already in this early phase of the discipline, explanations for land degradation and human adaptation to changing environments were sought in the combined influence of local features of the biophysical and institutional environment, and ecological and political processes at higher scales (cf. Watts, 2000). Blakie and Brookfield (1987, p. 17), for example, emphasised that the complexity of human–environment interactions can only be understood by investigating 'the contribution of different geographical scales and hierarchies of socioeconomic organisations (e.g. person, household, village, region, state, world)'. This statement was further elaborated in Blaikie's (1995) 'chain of explanation', which explains land degradation by combining local physical changes in soil and vegetation and associated local economic symptoms and land-use practices with the resources, skills, assets, time horizons and technologies of land users, the (institutional) nature of agrarian society, the state and, ultimately, the international economy. Neumann (2009) notes that at that time scale was seen in terms of both spatial extent ('geographical scale') and organisational levels ('hierarchy of socioeconomic organisations'). According to this distinction, examples of geographical scale are individual farm plots, villages, regions, countries and the world, while households, village councils, national governments and multilateral organisations are examples of organisational levels. The more recent literature follows Cash *et al.* (2006), who define scale as an analytical dimension (e.g. geographical, temporal or institutional scales) and levels as the unit of analysis within these scales. In this view, farm plots, villages, etc. are levels of geographical scale and households, village councils, etc. are levels within the jurisdictional scale (Figure 2).

Political ecology, as it developed in the 1990s, is also about power imbalances and social action, gender's place in the political ecological landscape, the role of the politics of knowledge and discourses in natural resource management, and institutional politics (see Peet and Watts, 1996 for an overview of the prevailing themes). Since the turn of the century, the political ecological literature has been more concerned with cross-scale interactions (e.g. Adger *et al.*, 2006; Neumann, 2009) and resilience and adaptation to global change (e.g. Adger, 2000; Batterbury and Mortimore, 2011). Figure 2 takes these themes into account and situates the NTFP production system in an overall livelihood strategy that is influenced by ecological, economic, sociocultural and political factors at different scales. The components that form part of the overall bricolage process depend on ecological, economic and political, institutional and sociocultural factors at different scales. The scales included in the figure are the most commonly researched: spatial, jurisdictional (here also including institutional aspects) and temporal. This is not to deny the importance of other scales identified in Cash *et al.* (2006), such as management, networks and knowledge. Interactions between levels of knowledge (with local/traditional knowledge at one end of the scale and knowledge of international research institutions at the other, and bridging organisations mediating between them) may result in joint learning and problem solving (Berkes, 2009; see also Buizer *et al.*, 2011). Networks (producer associations at the one end and for instance global NGO networks at the other) also have a significant impact on decisions regarding NTFP use (Ros-Tonen *et al.*, 2008). Some of these elements have been integrated into the figure, such as the presence of donors and NGOs promoting NTFP trade or engagement in global voluntary governance mechanisms, such as certification. Similarly, discourse use, which is usually part of the knowledge scale, is included here as the impact of sustainability and empowerment discourses are important drivers promoting NTFP trade (see e.g. Banjade and Paudel, 2008).

[Figure 2 about here → landscape on a separate page]

The different factors included in the scheme pose constraints as well as opportunities. Global environmental change – climate change, with associated droughts, floods and more irregular rainfall, as well as deforestation and the associated loss of species – puts increasing pressure on NTFP production systems. Deficient infrastructure, limited credit opportunities and lack of market demand for most of the species are important economic constraints to NTFP trade. In the institutional sphere, rules regulating access to resources and the trade in NTFPs may hinder livelihood opportunities (Ros-Tonen and Kusters, 2011).

There are also opportunities. Cultural preference for bushmeat and other NTFPs among migrants to cities or overseas has created a significant market for these products (Cunningham, 2011; Cocks *et al.*, 2011; Van Vliet *et al.*, 2011). Also, partnerships with businesses, donors and NGOs operating at higher scales can create access to profitable niche markets that might otherwise have remained out of reach (Ros-Tonen, 2007; Ros-Tonen *et al.*, 2008). Emerging carbon markets may render NTFP production systems more profitable if they can qualify for carbon payments (Montagnini and Nair, 2004). However, with the exception of a few high-value commercialised NTFPs (Kusters and Belcher, 2004; Kusters *et al.*, 2006), the forest (and the NTFP production system) does not offer much scope for poverty elimination (Wunder, 2001). The livelihood system in Figure 1 therefore encompasses a broader range of options, including labour market opportunities elsewhere (at regional, national or global level), social provisions and remittances from migrants abroad. The latter can be a substantial factor in improving livelihoods in rural communities (see e.g. Kabki *et al.*, 2004).

The results in terms of landscape change are as complicated as the productive bricolage process itself. Gray (1999) illustrated this nicely for southwestern Burkina Faso, as Batterbury (2001) did for Niger and Woldeamanuel (in this volume) for the lowlands in Ethiopia. Gray's case is exemplary for the importance of scale. Seen from the regional level, aerial photographs revealed land degradation in the form of increased deforestation, expansion of farmland and increases in areas characterised as degraded. This was due to technological change (animal traction, cotton production) and the influx of migrants. However at the micro level, this had not resulted in a decline of soil fertility, as farmers responded to increasing land pressure with erosion prevention, organic fertilisation, nurturing trees and other forms of intensification. This reminds us of the famous 'Machakos miracle' in Kenya described by Tiffen *et al.* (1994): despite a population growth from 240,000 in 1930 to 1.4 million in 1990, Machakos district experienced a threefold increase in agricultural output per capita in the same period thanks to farmers' investments in terracing and soil conservation. Although they did not use the term, the work of Burgers and Zaal (2009) illustrates that such investments in terracing and soil conservation (which impact on the landscape) are related to productive bricolage and the complex of scale factors brought together in Figure 2. They did so by showing the importance to farmers' livelihood portfolios of (1) location (to nearby labour markets, allowing farmers to earn non-farm income on a seasonal basis, which they can then use for investments in their farm plots), (2) infrastructure (a road that gives access to markets), and (3) developments on the world market (e.g. favourable coffee prices). These examples illustrate once again the importance of considering multiple scales in the analysis of livelihood dynamics and their impacts on the landscape.

Where NTFP production plays an important role in the productive bricolage process (as among the supplementary and integrated households distinguished by Belcher *et al.* (2005)), Wiersum's evolutionary continuum in forest–people interactions and co-domestication of forest and trees may apply and result in corresponding changes in the landscape. In such

cases, vegetation change is to a large extent directly related to NTFP production. This also applies to households that specialise in profitable NTFPs, such as damar farmers in Sumatra, Indonesia, who establish and maintain biodiverse agroforests (Kusters, 2009).

In most cases, however, people's decisions regarding resource and land use are influenced by a more complex set of factors than their desire for NTFPs. The very same productive bricolage process can also undermine the NTFP system. Several studies demonstrate that increased income, from both NTFP trading and non-farm activities, is often invested in the expansion of farming land (Demmer and Overman, 2001; Escobal and Aldana, 2003), and that (with the exception of some culturally important species) overall NTFP consumption tends to decline with increasing incomes (Dove, 1993; Godoy and Bawa, 1993). This suggests that what is an opportunity in terms of livelihoods may lead to a decline in the NTFP system, which then gives way to farmland and pasture, with corresponding impacts on the landscape.

Conclusion

In this chapter I have explored the relevance of the productive bricolage concept for NTFP research. This concept is more encompassing than livelihood diversification, and offers an approach by which to examine livelihoods, everyday decisions on natural resource use and landscape change in a holistic way. This fits nicely into Wiersum's conceptualisation of human–environment interactions, such as the co-domestication of forests and trees. Studying NTFP production systems as part of productive bricolage processes helps us to understand the role of NTFPs in people's struggles to build their livelihoods and how they modify the landscape to that end. Whereas Wiersum stresses the human creativity in this process, reliance on NTFPs in a process of productive bricolage is mostly a sign of precarious livelihoods in which livelihood dynamics are not exclusively driven by choice, but also by necessity. In most of the cases it holds little promise for lifting people out of poverty, as several authors have claimed before (Belcher *et al.*, 2005; Sunderlin *et al.*, 2005).

However, the productive bricolage concept in itself does not provide a sufficient basis to fully understand the dynamics of livelihood portfolios and land-cover change. Increasing integration of local natural resource management in multilevel and cross-scale networks requires a broader approach. Political ecology is such an approach, with a rich tradition in studying the interaction between ecological, economic, institutional, political and sociocultural phenomena at various scales. Such a perspective enables us to gain a deeper insight into the drivers of land-cover change and the constraints and opportunities that determine people's choices regarding land and natural resource use. In combination, productive bricolage and political ecology provide the ingredients for a more holistic analysis of the NTFP production system as a component of both livelihoods and landscapes.

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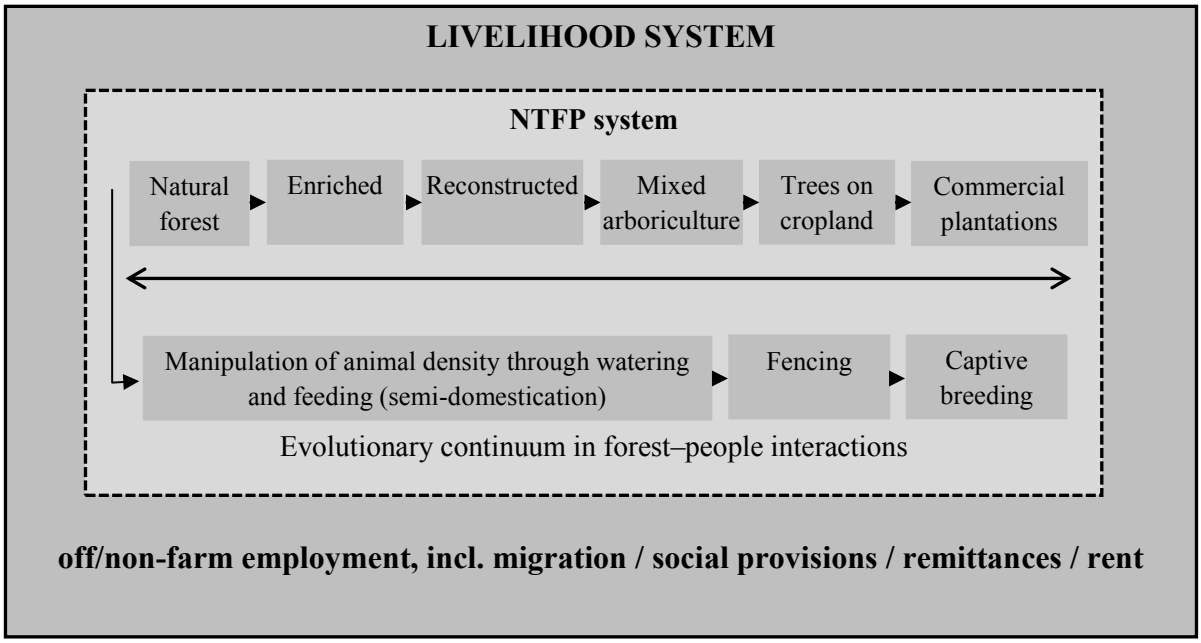
LIVELIHOOD SYSTEM
NTFP system
Natural forest
Enriched
Reconstructed
Mixed arboriculture
Trees on cropland
Commercial plantations
Manipulation of animal density through watering and feeding (semi-domestication)
Fencing
Captive breeding
Evolutionary continuum in forest–people interactions
off/non-farm employment, incl. migration / social provisions / remittances / rent

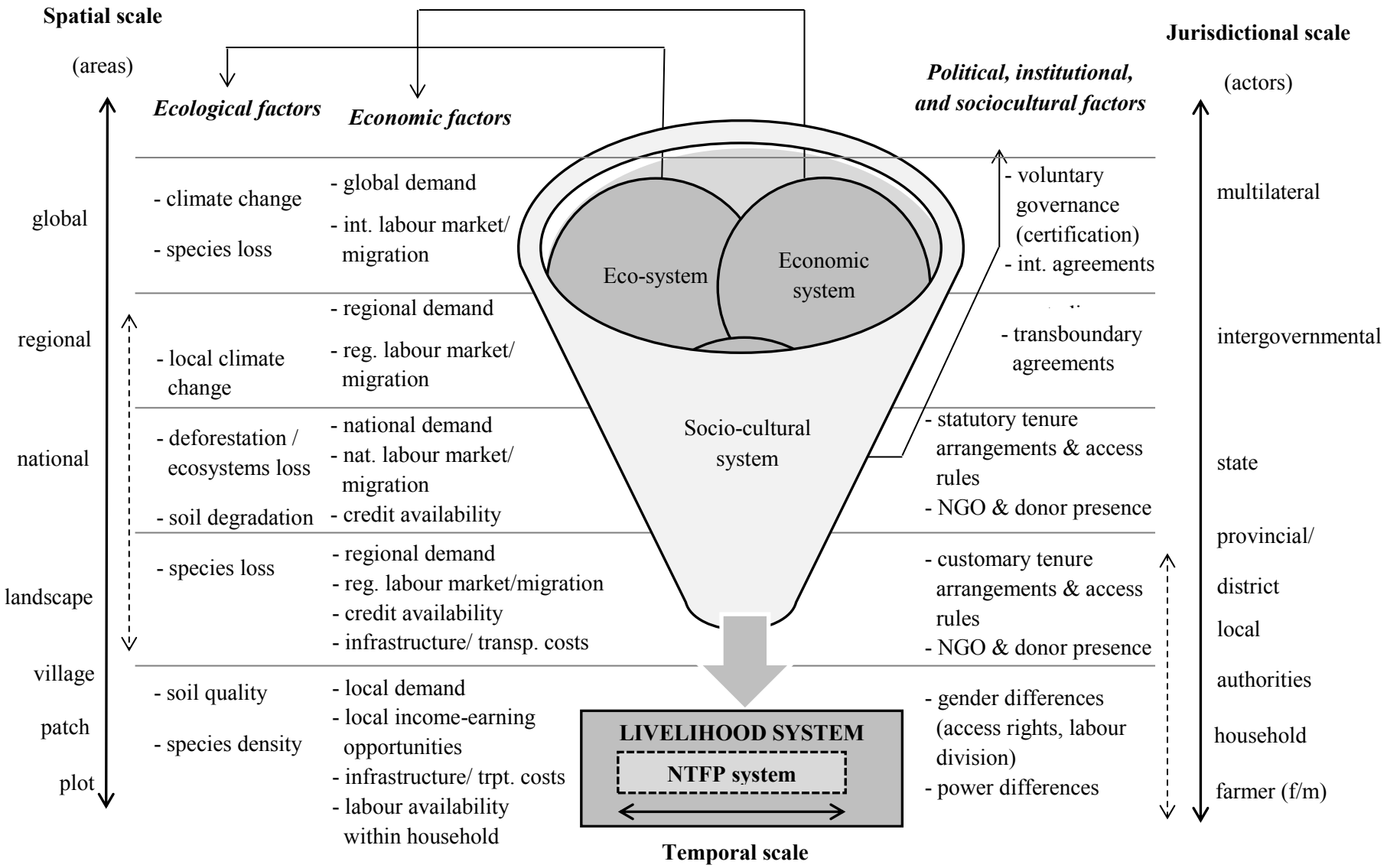

Figure 2. A political ecological approach to understanding productive bricolage in NTFP systems