U. of K. J. Agric. Sci. 21(1), 1-25, 2013

An Analytical Framework for Assessing the Effect of Income from Non-timber Forest Products on Poverty Alleviation in Savannah Region, Sudan

Yahia Omar Adam, Jürgen Pretzsch and Davide Pettenella

[1]Faculty of Forestry, Department of Forest Management, University of Khartoum, Shambat, Sudan
[2]Institute of International Forestry and Forest Products, Dresden University of Technology, Tharandt, Germany
[3]Dipartimento Territorio e Sistemi Agro-Forestali, Agropolis, Università di Padova, Italy.

Abstract: The study objective was to develop an analytical framework to assess the effect of income from non-timber forest products (NTFPs) on poverty alleviation in the Savannah region of Sudan. The study developed a conceptual framework based on a production-to-consumption system. A framework was developed from the analysis of three case studies selected from the Savannah region of Sudan based on their economic value. The framework considered income from NTFPs to be influenced by resource base, markets for the products and households' characteristics within the political environment. The effect on poverty alleviation was achieved by the potential traded products through the creation of capital invested in other livelihood activities. The developed framework could potentially be of direct value to assess the impact of income from NTFPs on poverty alleviation in the Savannah region. It also directs decision makers and development planners to focus on those NTFPs with the highest capacity for poverty alleviation; and to diagnose factors influencing the NTFPs financial returns. Research on other NTFPs from different areas within the Savannah region is highly recommended to facilitate comparison and generalization.

Keywords: Forest products; rural income; poverty alleviation; Savannah region; Sudan

---

[1] Part of a thesis submitted by the first author to the Technical University of Dresden, Germany, in fullfilment of requirements for the Ph.D. degree

INTRODUCTION

Reviews suggest that studies may have been unduly optimistic about potential contribution of non-timber forest products (NTFPs) to poverty alleviation (Sheil and Wunder 2002; Ros-Tonen and Wiersum 2005). Many NTFPs have been harvested unsustainably, resulting in resource degradation (Peters 1996). In a comprehensive review of NTFPs trade, Neumann and Hirsch (2000) pointed out that the sale of NTFPs often tends to provide a low level of income for the poorest specimen of communities rather than providing a source of socioeconomic development. The NTFPs trade may actually be responsible for creating rather than alleviating poverty. However, the term 'NTFPs' includes a very wide range of forest products and though some NTFPs appear to be promising for poverty alleviation, others are harvested intensively in a way that excludes some actors from the process (Belcher 2004).

The high diversity of NTFPs challenges the development of a conceptual framework that would enable impact of NTFPs case studies to be assessed. The literature relating to NTFPs, though abundant, tends to be characterized by detailed investigations of individual case studies, with relatively little attention given to synthesis, generality or theory (Neumann and Hirsch 2000). The lack of an analytical framework, that would enable the integration and assessment of results from different NTFPs case studies, hinders theory development (Arnold and Ruiz Perez 1996).

Most available models of NTFPs trading are conceptual in nature (Wilkie and Godoy 1996; Homma 1996). As noted by Arnold and Ruiz Perez (1998), deterministic models for management and use of NTFPs are likely to have limited applicability, because of the complexity and variability of the situations under which NTFPs trading takes place. Furthermore, as an interdisciplinary focus is an essential feature of NTFPs research (Neumann and Hirsch 2000), an analytical framework that enables different case studies' results to be integrated and assessed is necessary. In order to make such evaluations and comparisons, multiple case studies

using the same approach and methodology are required (Ruiz Perez and Byron 1999; Belcher and Ruiz Perez 2001; Shackleton *et al*. 2001; Marshal *et al*. 2003). The objective of this study was to develop an analytical framework to assess the impact of NTFPs income generation on poverty alleviation in the Savannah regions of Sudan.

METHODOLOGY

Development of an analytical framework

Production-to-consumption system (PCS), described by Belcher (1998), was used as a basis for analyzing the selected case studies. The PCS is considered in three dimensions (Belcher *et al*. 2005). The first, the vertical dimension, refers to the flow of material from its production in the biological system, through the various transactions and processes, to final consumer. The second, the horizontal dimension, concerns the set of individual firms operating at a particular point in the market chain and the scale of activity and relationships among them. The third dimension is that of intensity. It relates to the amount of labour and capital that is used to carry out a particular function. The approach has its root in agricultural marketing research (Belcher 2004). The literature review regarding PCS indicates several generalizations. First, it presents key variables and indicators that are important to be examined in PCS. The objective of developing an analytical framework that evaluates the outcomes from the NTFPs case studies warrants the need to investigate these PCS steps as major elements for the model. Secondly, the importance, sequence and complexity of each of the steps in the PCS as well as the range of factors affecting this, may differ from product to product and from situation to situation, and indeed not all steps may be present (Marshall *et al*. 2003). Thirdly, the literature review has identified a number of major shortcomings of previous research. Despite their general suitability in highlighting broad groupings of case studies, according to different household economic strategies, the data presented by Center for International Forestry Research (CIFOR) illustrate continuous variation among case studies with respect to the variables considered and the method of data collection. Based on the above-mentioned generalizations,

and in an attempt to alleviate the shortcomings of past research, this study followed a production-to-consumption system for analysing the selected NTFPs case studies, using the same methodology. In this study, the NTFPs livelihood strategies classification was based on their contribution to household's total income and their financial expenditure sources. The key variables and indicators that influence the livelihoods strategies outcome were captured from the production-to-consumption steps analysis. The role of the NTFPs income generation in poverty alleviation is financial capital creation.

Study approach

This research employed a multiple case study design (Yin 1994). Three locally traded NTFPs were selected as multiple-case studies in the Rashad Locality of the Nuba Mountains to carry out a comparative study. The same approach and methodology was used for each case study. To ensure that all relevant data were collected, the study followed the comprehensive guidelines developed by CIFOR for large global projects comparing NTFPs cases (see Belcher and Ruiz Perez 2001; Ruiz Perez *et al*. 2004).

Sampling design

One sampling strategy - purposive sampling - was used to select 276 households and key informants. The participants were members of households who live and were in the village or in the local markets during the survey, officials and key players further up the market chain and consumers. The actors were purposively selected to permit the collection of more in-depth and reliable data (Wollenberg 2000).

Data requirement and measures of variables

The study followed a production-to-consumption system (PCS) approach (Belcher, 1998) and built on the methodology proposed by Ruiz Perez and Byron (1999) to analyse divergent cases. Based on this methodology, a set of variables was chosen to provide data and information about production-to-consumption systems for selected NTFPs. In addition, the sustainable livelihood approach (DFID 2000) was applied to provide data about the outcome from the NTFPs activities.

Methods of data collection

(a) Rapid Rural Appraisal (RRA): Several RRA techniques and tools were applied to collect the required quantitative and qualitative data. These were (i) interviews which are one of the most important sources for case study data collection (Yin 1994) and (ii) direct observation. This multi-methods approach is necessary to attain the required insights, depth and contextual setting for each case study (Cunningham 2001).

(b) Household survey: It was conducted using structured interviews among households who collect or trade each of the selected NTFPs. In total, 221 household collectors and 62 household traders were interviewed in villages and local markets, respectively, where the collection and trading of the selected NTFPs are concentrated.

(c) Market survey: It was used to obtain quantitative data on prices, taxes and quantities sold.

Data tabulation

Researchers commonly use the income approach techniques to calculate the annual value of NTFPs or the products and services approach, whereby the physical production of goods and services is valued using actual or surrogate market prices of the resource. Quantities of NTFPs collected were registered per season. The collectors' gross and net cash income were determined for each product individually on an annual basis. Gross annual cash income was calculated based on collectors' recall of weekly sales of the fruits (e.g. number sold last week), the number of weeks/months collectors sold the fruits over season and selling price. Sack cost was substracted from gross annual cash income to obtain net annual cash income per household collector. Traders' gross annual cash income was calculated based on the quantities traded per week, an average based on the number of selling months per season and selling prices. Stock purchase and transportation cost, state and locality taxes, and royalties were substracted from gross annual cash income to obtain annual net cash income per trader. All of the above were computed on a case-by-case basis and then averaged, allowing for the measure of variation around the mean. Information about agricultural crop yields and

sale prices of commercial products were obtained from individual households through the questionnaire survey.

Prices of subsistence crops were obtained from the local market. Income from commercial farming was computed by multiplying the crop yields with their farm gate prices. Income from subsistence crops was computed by multiplying crop yields by local market prices. Livestock number and products were calculated by multiplying the number of animals sold and/or consumed by the average price in the local market of each item. Labour earnings from local employment wage were calculated by multiplying the number of days worked by the wage rate. Number of days of wage and wage rates for various activities was provided by household members. Information on employment was collected from individual members in terms of the number of hours worked per day and number of days worked in each operation. Employment was expressed in terms of person-days, where each person-day was equivalent to eight hours of work. Remittances value was calculated by multiplying the amount of remittance per month by the number of months the household received the remittance. The income from household land rent was estimated based on the household's recalls.

RESULTS AND DISCUSSION

Contribution to household's income

The contribution of trade in selected NTFPs to household annual average total income varied from actor to actor, along the market chain. This annual value was relatively low for the collectors of *Adansonia digitata* (US$ 336), *Ziziphus spina-christi* (US$ 231) and *Balanites aegyptiaca* (US$ 97) fruits, while the annual average income for traders of *A. digitata*, *Z. spina-christi*, and *B. aegyptiaca* fruits were US$ 15862, US$ 4635 and US$ 8522, respectively. The gross profit also varied across households along the market chain of the products. This value was relatively low for the collectors of *A. digitata* (US$ 331), *Z. spina-christi* (US$ 202) and *B. aegyptiaca* (US$ 91) fruits, whereas the annual average gross profit was relatively high for the traders of *A. digitata* (US$ 3695),

Z. spina-christi (US$ 2191) and *B. aegyptiaca* (US$ 3199) fruits. These findings are similar to these of Dounias (2004) who found that the average annual income for harvesters of edible palm weevil larvae was significantly higher than that obtained by unskilled workers in towns or by the producers of cocoa or coffee.

Contribution to household's annual total income

Cash income from NTFPs trade varied across households and products (Fig. 1). *A. digitata* fruit collectors generated high earnings that contributed a high proportion to the total income (>50%) (Fig.1). This finding agrees with studies conducted in Ecuador by Grimes *et al.* (1994). However, there is exception as Ruiz Perez *et al*. (2004) stated that in Africa NTFPs cases tend to contribute less than 50% to annual total household income. The contribution of *Z. spina-christi* and *B. aegyptiaca* fruits to household total income was <50% (Fig. 1). This finding agrees with Gunatilake's (1998) study in Sri Lanka and Ruiz Perez *et al*. (2004) conclusion on African NTFP cases.

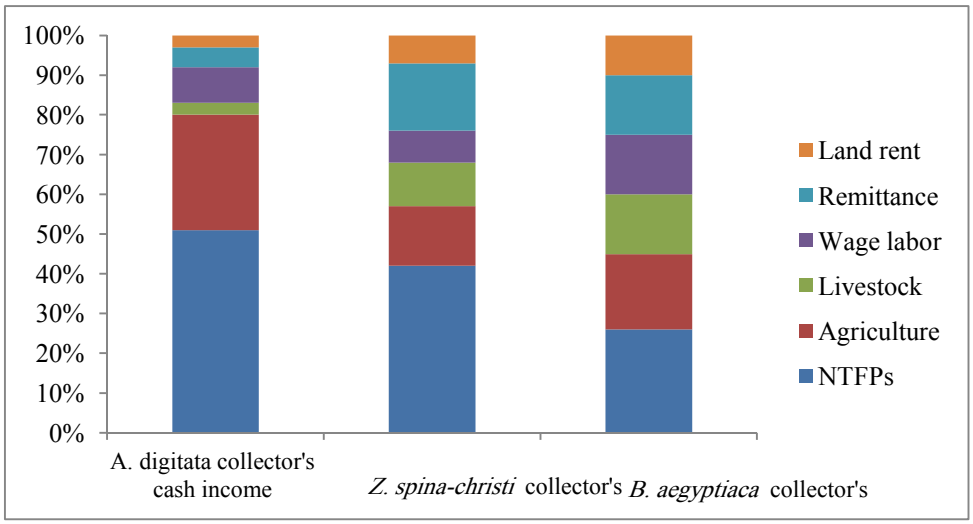

Fig. 1. Annual average cash income (US$) contribution from the studied NTFPs

The observed importance of NTFPs commercialization to households is related to this scenario. In general, the higher the product shares the more significant the household (collector/trader) considers the income for the household. All *A. digitata* fruit collectors and 55% of *Z. spina-christi* fruit collectors indicated that local trading was their most important source of income, 69.2% of *B. aegyptiaca* fruit collectors fit this classification as well (Table 1). This implies that collectors trading *A. digitata* fruits tend to be more dependent on local trade for their livelihood than the latter. The contribution of *A. digitata* fruit sales to household annual total cash income was relatively higher than *Z. spina-christi* and *B. aegyptiaca* fruit sales. This is due to the fact that *A. digitata* fruit selling is a more specialized activity than just a cash income gap filler, due to its regular engagement as well as developed traditional institutions at the village-level that govern access to the primary resource and the collection of the fruits. Cash income generated by *A. digitata* fruit encourages households to invest some of their capital in fruit collection and transportation to local markets.

Table 1. The importance of selected NTFPs to total household cash income

	Product type		
	A. digitata	*Z. spina-christi*	*B. aegyptiaca*
Rating of households for local trade as their most important source of household income	100	55.0	69.2
Perceived importance of trade for households (% of collectors)			
Very important	73.7	68.6	60.0
Important	10.5	12.8	12.3
Slightly important	10.5	10.0	13.9
Not important	5.3	8.6	13.8
% of collectors who would prefer to do something else			
Yes	9.2	37.1	80.0
No	90.8	62.9	20.0

Household expenditure from NTFPs trade

Fig. 2 shows that 62%, 13%, 8% and 17% of the interviewed collector households spent income from *A. digitata* fruit sales on food, education, health care and capital accumulation, respectively. The interviewed trader households spent their income from fruits trade on food purchase (15%), education (3%), health care (6%) and capital accumulation (76%), annually. The collector households spent all their returns from *Z. spina-christi* sales on food purchase, while the trader households spent 73% of their financial returns on food, 19% on education and 8% on health care expenses. The collector households spent all the annual financial returns from *B. aegyptiaca* fruit sales on food purchase, while the trader households spent 84% of their annual earnings on food and 16% on education.

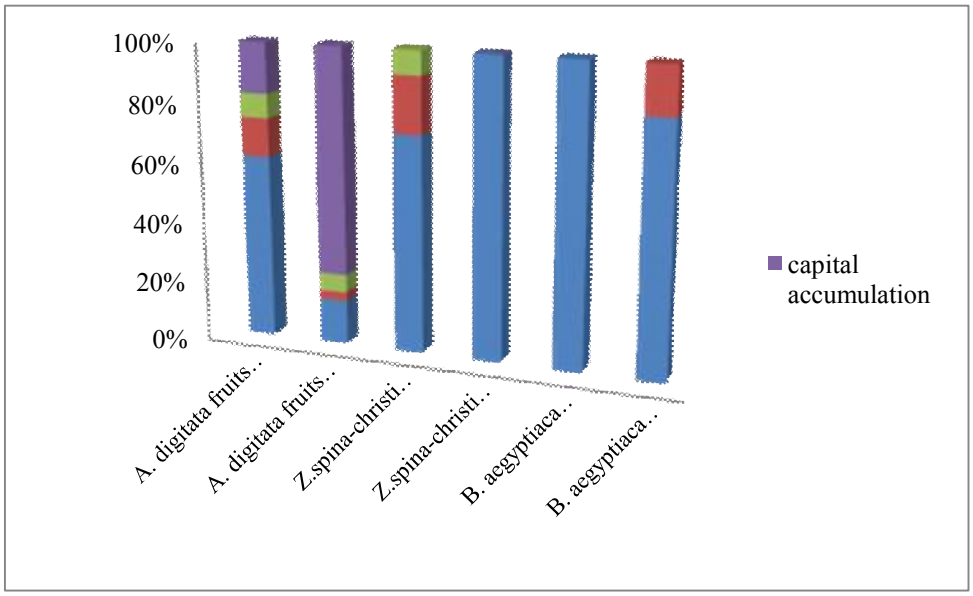

Fig 2. Annual expenditure sources from studied NTFPs sale and the proportion of collectors/traders related to each expenditure source.

Factors affecting household income from products trade

Studies revealed that the NTFPs trade is complex, dynamic and influenced by a suite of interrelated factors (de Beer and McDermott 1996; Neumann and Hirsch 2000; Arnold 2002; Kusters and Belcher 2004; Alexiades and Shanley 2004; Sunderland and Ndoye 2004). Some of these factors are related to actors characteristics (Nygren *et al*. 2006); product markets (Neumann and Hirsch 2000; Arnold 2002; Nygren *et al*. 2006); political environment under which participants trade their products (Nygren *et al.* 2006; Neumann and Hirsch 2000); and base resource characteristics (Neumann and Hirsch 2000).

Actor's characteristics

Cash income generation from other household's livelihood sources illustrated positive and significant association with the cash income earned from *A. digitata* (18.32) and *B. aegyptiaca* (0.28) (Table 2). It is noteworthy that households with other livelihood income sources gained more income in absolute terms than households with no other income sources. Such finding is common in some NTFPs related studies, e.g. Cetachew *et al.* (2007). This is mostly due to the fact that access to extra financial capital is important as this assists households to overcome numerous constraints such as cash flow problems and high transportation costs, allowing them to collect more often or reach more distant markets outside the study area. In fact, there are also results demonstrating the opposite (e.g. Shackleton 2006; Inoni 2009), which indicate that poor households derive more income from the collection and selling of NTFPs than those in the wealthy category.

Labour input for collection and selling of the selected NTFPs was positively and significantly correlated with the net income from *A. digitata*, *Z. spina-christi* and *B. aegyptiaca* fruits trade (Table 2). This is due to the fact that some households work for a long time. Additionally, families with large labour force, on account of the time available, can collect or sell more NTFPs than households with less time available to collect or sell the products. Access to labour is a significant factor determining how people use their natural resources (Belcher *et al*. 2005).

Table 2. Coefficients from a multiple regression analysis of net income from local-level trade in *A. digitata, Z. spina-christi,* and *B. aegyptiaca* fruits. Variables showing a significant relationship with income ($P < 0.05$) are indicated by *

Independent variables (for yes/no variables: y=1; n=0)	Unstandardized coefficients		t	P-value
	B	ES ±		
Adansonia digitata fruits				
(Constant)	648.41	161.89	4.01	0.000*
Producer age (yrs)	7.35	15.73	0.47	0.64
Producer education level (yrs in education)	11.76	14.72	0.79	0.43
Other income sources (y/n)	18.32	36.67	4.50	0.000*
Product price (US$/Kg)	49.22	143.78	3.34	0.003*
Market transparency (y/n)	61.92	44.34	1.39	0.168
Product demand (y/n)	12.573	33.83	0.37	0.711
Market access (Km)	83,10	27.04	3.07	0.002*
Product availability (y/n)	4.66	36.75	0.13	0.899
Labour input (hrs/yr)	2.69	0.62	4.32	0.000*
Resource access (Km)	65.09	17.16	3.79	0.000*
***Ziziphus spina-christi* fruits**				
(Constant)	-898.41	320.19	-2.81	0.007*
Producer age (yrs)	73.76	55.15	1.34	0.186
Producer education level (yrs in education)	40.77	50.89	0.80	0.426
Product price (US$/Kg)	2.32	2.08	1.11	0.010*
Market transparency (y/n)	172.56	126.76	1.36	0.178
Product demand (y/n)	656.71	128.74	5.10	0.000*
Market access (Km)	44.11	55.51	.79	0.430
Product availability (y/n)	122.11	131.66	2.93	0.057*
Labour input (hrs/yr)	33.85	0.54	2.58	0.020*
Resource access (Km)	365.64	82.17	4.45	0.000*

Table 2. Cont.

Independent variables (for yes/no variables: y=1; n=0)	Unstandardized coefficients		t	P-value
	B	ES ±		
Balanities aegyptiaca fruits				
(Constant)	5.02	3.77	1.33	0.189
Producer age (yrs)	0.36	0.61	0.58	0.564
Producer education level (yrs in education)	-0.41	0.47	-0.87	0.388
Other income sources (y/n)	0.29	1.27	2.23	0.023*
Product price (US$/Kg)	0.00	0.08	0.00	0.99
Market transparency (y/n)	1.22	0.99	1.22	0.226
Product demand (y/n)	0.85	0.86	1.98	0.031*
Market access (Km)	0.55	0.47	1.17	0.247
Product availability (y/n)	0.07	0.83	0.08	0.936
Labour input (hrs/yr)	19.23	0.02	9.98	0.000*
Resource access (Km)	1.42	1.89	1.75	0.045*

Products Market

Products price was significantly and positively associated with the income derived from *A. digitata* and *Z. spina-christi* fruits local-level trade. However, the price of *B. aegyptiaca* fruits was insignificant (Table 2). This is due to the fact that most the collectors sell their fruits in their villages where the price is low. The *Z. spina-christi* fruits demand was significantly and positively associated with the income from the fruits. Market access for the *A. digitata* fruit collectors was significantly and positively correlated with the income from the fruits trade but the correlation was insignificant for *Z. spina-christi* and *B. aegyptiaca* fruit collectors (Table 2). This is due to the fact that the two fruits lack national and international markets with high prices that differ from the local markets with low prices.

Lack of organization and cooperation between the surveyed households trading the studied NTFPs influence the income due to their contribution to high transaction costs that prevent some households from transporting

their products to distant markets. Additionally, trading the selected products individually represents the weak competition between the collectors, and this limits the bargaining power in local markets due to inadequate information on products market conditions and prices (Adam and Pretzsch 2010). Newton *et al*. (2006) mentioned that lack of organization that links collectors or processors to consumers significantly limits the commercialization of 74% case studies considered by CIFOR project. Number of product markets is another factor limiting the income returns from local-level trade due to its contribution to markets saturation that affects the amount of cash income received from local-level trade in the selected products. Most of the surveyed sample mentioned that their products often take a longer time to be sold than previously, and this resulted in investing more time in selling the fruits. The challenge is to promote access to potential markets in big cities. However, access to these markets requires enriching local actors' knowledge about how to deliver the products with the quality needed.

Lack of market information, together with market intelligence and the ability to use the information, affect the income earned from the studied NTFPs. In the case of *A. digitata* fruits, the entrepreneur plays an important role in providing market information and translating this information into price differentials for the grades of the fruits demanded by the consumer. However, it is important to note that market information alone is not sufficient to ensure high returns from the trade of the studied products; households also need to have the capacity to act on the market information that they receive. In the case of *B. aegyptiaca* and *Z. spina-christi* fruits, some collectors are aware of prices and market requirements but are unable to organise themselves to send their collection further to potential markets with higher prices or to force the local traders to pay the price requested by the sellers.

Road links connecting the villages with the local and the regional markets are poor or do not exist in some cases. Most of the villages in the study area are completely cut-off from the rest of the country during the rainy season (June to October) due to the muddy soil type which inhibits vehicles. Such obstacles increase transaction costs which make the market

chain associated with high costs and ultimately reduce the cash income or make the market chain unattractive to households (Adam and Pretzsch 2010). Poor infrastructure, access to markets and low product prices also limit the potential benefit for local people from the chosen NTFPs. Such constraints seem universal as most NTFPs case studies reveal more or less similar conditions. For instance, many scholars reported almost similar constraints (e.g. Marshal *et al*. 2003; te Velde *et al*. 2006). Improving market infrastructure will enhance proportionally the returns of selected NTFPs and rural household economies.

Changes in demand, whether in an upward or downward direction, are another factor which influenced the financial returns from the products. These changes are driven by a wide range of factors. For example, changes in accessibility and transportation possibilities have huge impacts on forest product markets. Technological innovations can replace natural products or, comversely; create new uses for natural products as consumers' preferences change over time. García-Fernández (2004), for instance, reveals that the demand for *benzoin* (a resin produced by *Styrax* trees in Sumatra) has decreased because the use of *benzoin* has become less common and younger generations of Indonesians prefer modern cigarettes to the traditional ones that use *benzoin*. The expanding domestic demand for oak mushrooms in South Korea has a popular perception that they are natural food free of chemicals (Youn Yeo Chang 2004). Future demand for many forest products may depend on such niche markets; however, the new markets may be unpredictable (Rai 2004).

The resource (NTFPs)

The access to resources is significantly and positively associated with the net income from *A. digitata*, *Z. spina-christi* and *B. aegyptiaca* fruits local trade (Table 2). The degree of access that households have to primary resource is closely linked to the type of land use and property regime in place. Access is far less problematic on state forests in comparison to private farms owned by the local inhabitants. Field observations revealed

that the selected products' trees are passively maintained, as both propagation and management are left to nature. Therefore, recent poor management of the primary resource contributes to threatening their long-term sustainability which ultimately influences the production of the fruits. Additionally, production systems that are based on naturally regenerated resources, without further management, are most susceptible to resource depletion, in particular when more households engage in the harvesting in response to high market demand or increasing prices (Adam and Pretzsch 2010). Higher demand and price provide an incentive for increasing production, for instance through intensifying management (Homma 1992).

Post-harvest storage and treatment (such as drying) can extend the economic life of the harvest, which reduces the urgency for selling and allows for the collection of large volumes, and can as such give producers more bargaining power (Belcher and Schreckenberg 2003). Processing the raw material into semi-final or final products adds value and can, therefore, be an attractive way for earning additional income (e.g. when *A. digitata* fruits are sold in the form of powder).

Political factors

The taxes by the state government and central government also constraint the level of financial returns from the local business as mentioned by most households. From formal and informal discussion with the households, it was found that households lack training, capacity building and organization to have an identity, and negotiate with different stakeholders regarding their needs, undertake group activities such as sharing transportation to distant markets, and cooperate in terms of, for example, price fixing, etc. Positive impact of NTFPs cases on economic development has a strong link to positive state-sponsored regulations that offer clear and well-known rights to people, techniques that do not put excessive pressure on the resource, a transparent market, well-organized gatherers, and the existence of external support (Ruiz Perez and Byron 1999). At the other end of the spectrum, cases where commercial exploitation of NTFPs is generally considered to have adverse consequences present themselves in situations where various conditions

affect the NTFPs market, such as state regulations that confront traditional rights and that are inadequately understood by the people, a nontransparent market approached by many individual sellers with poor organisation, and high pressure on the resource.

Framework development

An analytical framework to assess income generation effect on poverty alleviation

This study has revealed that there are many factors influencing the direction and the function of NTFPs for any particular product, and, consequently, the income generation from the NTFPs and their impact on poverty alleviation. Actors' characteristics, product markets, base resource and policy may influence the type and extent of benefits that the trade brings to collector households, both within and across different products. This study attempted to capture and explain some of the factors and the outcomes in the central part of the framework presented in Fig. 4 (Boxes 1-4) as follows:

1. **Policy** (Box 1) that reduces, to some extent, taxes and encourages capacity building to increase and sustain the financial benefits is needed.
2. **Actors characteristics** (Box 2) influence the extent of outcomes generated from the products commercialization. The study explained that the availability of other income sources was crucial for gaining higher financial returns from the products commercialization. Additionally, the labour input for collecting and selling the products is important to generate higher income from NTFPs trade.
3. **The resource** (Box 3) is important in determining the feasibility, size and sustainability of the local trade. These characteristics consist of a) tenure, b) access, c) availability, d) management and f) value addition.
4. **Markets** (Box 4) are key factors to enhance the positive outcome for NTFPs trade. The results showed that local markets are important but other factors, such as market access, lack of market organization, low prices, market saturation and demand for the products, are potentially growing problems. Thus, even if the potential exists, these opportunities are unlikely to be exploited without some external support.

The products trade represented subsistence and accumulation livelihood strategies (Box 5a). The function of subsistence strategy was to cover household consumption. The accumulative strategy supported household consumption and created a financial capital that contributed to poverty alleviation at both the individual and household levels (Box 5b).

CONCLUSION

The developed framework could potentially be of direct value to assess the effect of income generation from NTFPs on poverty alleviation. Additionally, it directs decision makers involved in supporting NTFP trading initiatives, enabling financial support and other interventions to be focused on those NTFPs with highest potential for poverty alleviation. The framework also could be used to diagnose constraints or factors influencing income generation from NTFPs and to explore the potential impacts of different policy interventions. The value of the framework as a decision-support tool is clearly limited by the fact that information was based on a sample of only three case studies from one country. A key question is that the extent to which the framework developed is applicable to other NTFPs and other areas. An important issue for any project considering a case study approach is how widely its findings can be applied; carefulness is required when generalising results from any single group of NTFPs. These findings are likely to be of relevance to communities trading the same products in the Savannah regions that share same socioeconomic and geographical characteristics, including poverty level, dependence on forest resources, access to markets, etc. One of the advantages of this framework is that additional information provided by further case studies could be incorporated into the framework. The analytical framework developed in this study enables additional factors to be incorporated, simply by identifying the type of indicator (e.g. related to market, resource, socioeconomic characteristics of actors, political, etc.) that is believed to have impact on income generation from NTFPs and ultimately poverty alleviation.

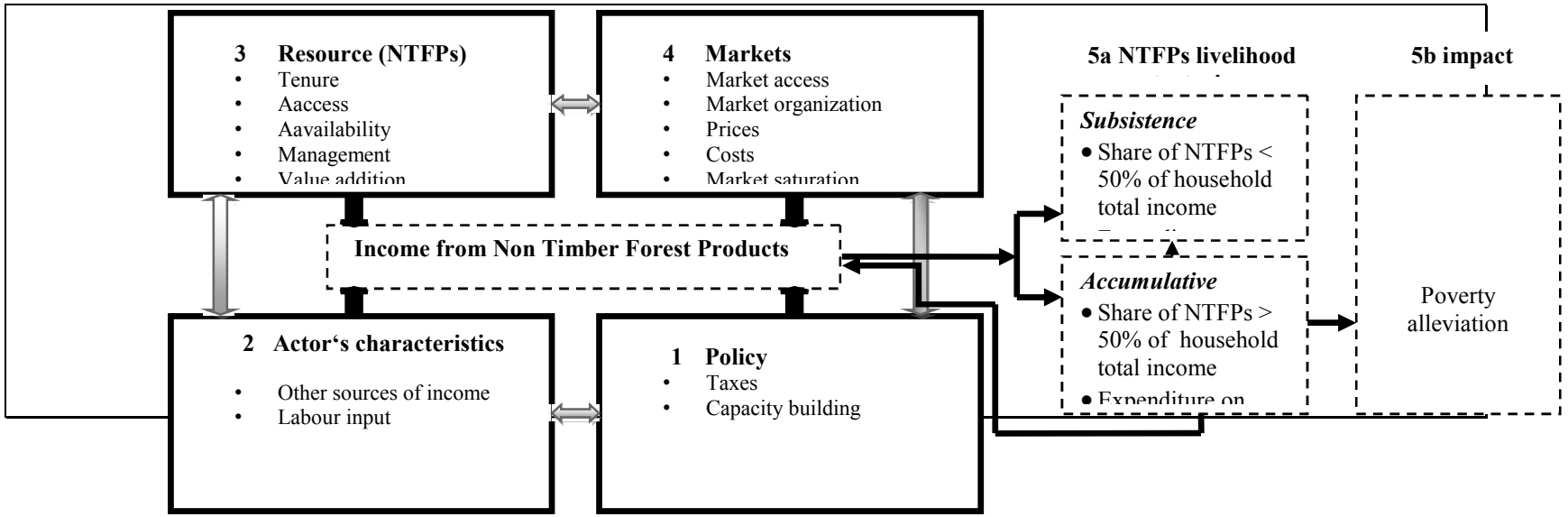

Fig. 5. An analytical framework to assess the effect of income generation from NTFPs on poverty alleviation

REFERENCES

Adam, Y.O. and Pretzsch, J. (2010). Contribution of local trade in *Ziziphus spina-christi* L. fruits to rural household's economy in Rashad Locality, Sudan. *Forestry Ideas* 1 (39), 19-27.

Alexiades, N.M. and Shanley, P. (2004). Forest products, livelihoods and conservations: Case studies of non-timber forest product systems, pp. 1-22. In: *Forest Products and Conservation: Case Studies of Non-timber Forest Product Systems*. Volume 3- Latin America. Center for International Forestry Research (CIFOR), Bogor, Indonesia.

Arnold, J.E.M. (2002). Socio-economic Benefits and Issues in Non-wood Forest Products Use. Non-wood Forest Products for Rural Income and Sustainable Forestry, pp. 20-35. Food and Agricultural Organization (FAO), Rome.

Arnold, J.E.M. and Ruiz Perez, M. (1996). Forming the issues relating to non-timber forest product research, pp. 1-18. In: Ruiz Perez, M. and J.M, Arnold (Edts.). *Current Issues in Non-timber Forest Products Research*. Center for International Forestry Research (CIFOR), Bogor, Indonesia.

Arnold, J.E.M. and Ruiz Perez, M. (1998). The role of non-timber forest products in conservation and development, pp. 17-24. In: E. Wollenberg and A. Ingles (Edts.). *Incomes from the Forest: Methods for the Development and Conservation of Forest Products for Local Communities*. Center for International Forestry Research (CIFOR), Bogor, Indonesia.

Belcher, B. (1998). A production-to-consumption system approach: Lessons from the Bamboo and Rattan Sector in Asia, pp. 57-84. In: E. Wollenberg and A. Ingles (Edts.). *Incomes from the Forest: Methods for Development and Conservation of Forest Products for Local Communities*. Center for International Forestry Research (CIFOR), Bogor, Indonesia.

Belcher, B. and Ruiz Perez, M. (2001). An international Comparison of Cases of Forest Product Development: Overview, Description and Data Requirements. CIFOR Working Paper No. 23. Center for International Forestry Research (CIFOR*)*, Bogor, Indonesia.

Belcher, B. and Schreckenberg, K. (2003). NTFP commercialization- a reality check. A document prepared for the NWFP side event, World Congress, Quebec, 20 September 2003.Center for international Forestry Research (CIFOR), Bogor, Indonesia.

Belcher, B.M. (2004). What isn't an NTFP? *International Forestry Review* **5** (2): 161-168

Belcher, B.; Ruiz Perez, M. and Achdiawan, R. (2005). Global patterns and trends in the use and management of commercial NTFPs: Implications for livelihoods and conservation. *World Development* 33, 1435-1452.

Cetachew, M.; Sjaastad, E. and Vedeld, L. (2007). Economic dependence of forest resources: A case from Dendi District, Ethiopia. *Forest Policy and Economics* 9: 916-927.

Cunningham, A.B. (2000). *Applied Ethobotany. People, wild plant use and conservation. People and Plants Conservation Manual*. pp. 23-34. Earthscan, London.

de Beer, J.H. and McDermott, M. (1996). *The Economic value of non-timber forest products in Southeast Asia.* Second revised edition. Netherlands Committee for the World Conservation Union (IUCN), Amsterdam.

DFID (2000). Sustainable guidance sheets. London. 5 p. (DFID), London.

Dounias, E. (2004). Edible weevil larvae: A pest for palm trees but a delicacy for city-dwellers. In: C. Julius and O. Ndoye (Edts.). Development of trade and marketing of non-wood forest products for poverty alleviation in Africa. *A report prepared for the project for Lessons Learnt on sustainable forest management in Africa*. Center for International Forestry Research (CIFOR), Regional Office for Central and West Africa. BP, Messa.

García-Fernández, C. (2004). Benzoin, A resin Produced by Styrax Trees in North Sumatra Province, Indonesia, pp. 151-156. In: K. Kusters and B. Belcher (Edts.) *Forest products, livelihoods and conservation*. *Case studies of non-timber forest product systems*. Volume 1 –Asia. Center for International Forestry Research (CIFOR), Bogor, Indonesia.

Grimes, A.; Looomis, S.; Jahnige, P.; Burnham, M.; Onthank, K. and Alarcon, R. (1994). Valuing the Rain Forest: The Economic Value of Non Timber Forest Products in Ecuador. *Ambio* 23 (7), 405-410.

Gunatilake, H. (1998). The role of rural development in protecting tropical rainforests: Evidence from Sri Lanka. *Journal of Environmental Management* 53, 273 – 292.

Homma, A.K.O. (1992). The dynamics of extraction in Amazonia: A historical perspective. In: D.C. Nepstad and S. Schwartzman (Edts.) *Non-timber products from tropical forest. Evaluation of A conservation and development strategy*. Advances in Economic Botany Volume 9, New York Botanical Gardens, Bronx, New York.

Homma, A.K.O. (1996). Modernisation and technological dualism in the extractive economy in Amazonia. pp. 59-82. In: M. Ruiz Perez and J.E.M. Arnold (Edts). *Current Issues in Non-timber Forest Products Research*. Center for International Forestry Research (CIFOR), Bogor, Indonesia.

Inoni, O.E. (2009). Effects of forest resources exploitation on the economic well-being of rural households in Delta State, Nigeria. *Agriculura Tropica et Subtropica* 42 (1), 20-27.

Kusters, K. and Belcher, B. (2004). *Forest products, livelihoods and Conservation. Case Studies of non-timber forest product systems*. Volume 1 – Asia. Center for International Forestry Research (CIFOR), Bogor. Indonesia.

Marshal, E.; Newton, A.C. and Schreckenberg, K. (2003). Commercialization of non-timber forest products: first steps in analyzing the factors influencing success. *International Forestry Review* 5 (2), 128-137.

Neumann, R.P. and Hirsch, E. (2000). *Commercialization of non-timber forest products: Review and analysis of research*. Center for International Forestry Research (CIFOR), Bogor, Indonesia.

Newton, A.C.; Marshall, E.; Schreckenberg, K.; Golicher, D.; te Velde, D.W.; Edouard, F. and Arancibia, E. (2006). Use of a Bayesian belief network to predict the impacts of commercializing non-timber forest products on livelihoods. *Ecology and Society* 11(2), 1-24.

Nygren, A.; Lacuna-Richman, C.; Keinänen, K. And Alsa, L. (2006). Ecological, socio-cultural, economic and political factors influencing the contribution of non-timber forest products to local livelihoods: Case studies from Honduras and Philippines. *Small-scale Forest Economics, Management and Policy* 5 (2), 249-269.

Peters, C.M. (1996). The ecology and management of non-timber forest resources. World Bank Technical Paper 322. pp. 37-42. The World Bank, Washington DC, USA.

Rai, N.D. (2004). The socio-economic and ecological impact of Garcinia gummi-gutta fruit harvest in the Western Ghats, India. In: K. Kusters and B. Belcher (Edts.) *Forest products, livelihoods and conservation. Case studies of non-timber forest product system*s. Volume 1 – Asia. Center for International Forestry Research (CIFOR), Bogor. Indonesia.

Ros-Tonen, M.A.F. and Wiersum, K.F. (2005). The scope for improving rural livelihoods through non timber forest products: An evolving research agenda. *Forests, Trees and Livelihood* 15 (2), 129-148.

Ruiz Perez , M.; Belcher, B.; Achdiawan, R.; Alexiades, M.; Aubertin, C.; Caballero, J.; Campbell, B.; Clement, C.; Cunningham, A.; Fantini, de Foresta, H.; Fernandez, C. G.; Guatam, K.; Hersch Martinez, P.; de Jong, W.; Kusters, K.; Kutty, M. G.; Lopez, C.; Fu, M.; Nair, T. K. R.; Ndoye, O.; Ocampo, R.; Rai, N.; Ricker, M.; Schrechemberg, K.; Shackleton, S.; Shanley, P.; Sunderland, T.; Youn, Y. (2004). Markets drive the specialization strategies of forest people. *Ecology and Society* 9 (2), 4-18.

Ruiz Perez, M. and Byron, N. (1999). A methodology to analyse divergent cases studies of non-timber forest products and their development potential. *Forest Science* 45 (1), 1-14.

Shackleton, C.M.; Shackleton, S.E. and Cousins, B. (2001). The role of land-based strategies in rural livelihoods: The contribution of arable production, animal husbandry and natural resource harvesting in communal areas in South Africa. *Development Southern Africa* 18, 581-604.

Shackleton, S. (2006). Household wealth status and natural resource use in the Kat River Valley, *South Africa. Ecological Economics* 57, 306-317.

Sheil, D. and Wunder, S. (2002). The value of tropical forest to local communities: complications, caveats, and cautions. *Conservation Ecology* 6(2), 9-24.

Sunderland, T. and Ndoye, O. (2004). *Forest products, livelihood and conservation. Case studies of non-timber forest product systems*: Volume 2: Africa. Center for International Forestry Research (CIFOR), Bogor. Indonesia.

te Velde, D.W.; Rushton, J.; Schreckenberg, E.; Arsncibia, F.; Edouard, E.; Marshal, E. and Newton, A.C. (2006). Entrepreneurship in value chains of non-timber forest products. *Forest Policy and Economics* 8 (7), 725-741.

Wilkie, D.S. and Godoy, R.A. (1996). Trade, indigenous rain forest economies and biological diversity. Model predictions and directions for research. pp. 83-102. In: M. Ruiz Perez and J.E. Arnold (Edts). *Current Issues in Non-timber Forest Products Research*. Centre for International Forestry Research (CIFOR), Bogor, Indonesia.

Wollenberg, E. (2000). Methods for estimating forest income and their challenges. *Society and Natural Resources* 13, 777-795.

Yin, R. (1994). *Case Study Research: Design and Methods*. 2nd edition. Beverly Hills, CA: Sage Publishing, United States. pp. 1-38.

Youn Yeo Chang (2004). The production of oak mushrooms (Lentinula edodes) as a source of farmers income in the Republic of Korea: the case of Cheongyang-Gun. pp. 34-36. In: K. Kusters and B. Belcher (Edts.) *forest products, livelihoods and conservation. Case studies on non-timber forest products systems*. Volume 1-Asia. Centre for International Forestry Research (CIFOR), Bogor.

إطار تحليلى لتقدير تأثير الدخل من المنتجات غير الخشبية علي تخفيف حدة الفقر في إقليم السافنا (السودان)

يحي عمر أدم[1] وجورجن برتش[2] و دافتى بتنيلا[3]

كلية الغابات، قسم الإدارة الفنية للغابات- جامعة الخرطوم، شمبات- السودان[1]

المعهد العالمى للغابات و منتجات الغابات- جامعة درسدن التقنية- المانيا[2]

قسم التشجير الزراعى- جامعة بادوفا، أقربولس- إيطاليا[3]

المستخلص: هدفت الدراسة لوضع إطار تحليلى لتقدير تأثير الدخل من المنتجات غير الخشبية على تخفيف حدة الفقر في اقليم السافنا بالسودان. استندت الدراسة فى تطوير الإطار النظرى علي نظام من الانتاج الي الاستهلاك. بني الإطار من تحليل ثلاث دراسات حالة لمنتجات غير خشبية من اقليم السافنا بناءا علي قيمتها الاقتصادية. إعتبر الإطار الدخل من المنتجات غير الخشبية متأثر بالمورد، الأسواق، خصائص الأسر تحت الظروف السياسية. يتحقق أثر تخفيف حدة الفقر من خلال مقدرة المنتجات غير الخشبية في خلق راس مال مادي والذي بدوره يستثمر في طرق الحياة الاخرى. الإطار المطور ذو قيمة مباشرة في تقدير تاثير الدخل من المنتجات غير الخشبية على تخفيف حدة الفقر فى إقليم السافنا. كما إنها توجه صانعى القرار و مخططى التنمية للتركيز على المنتجات غير الخشبية ذات المقدرة العالية على تخفيف حدة الفقر و تشخص َالعوامل التي تؤثر على العوائد المادية من تلك المنتجات. أوصى البحث بدراسة منتجات غير خشبية أخرى في مناطق مختلفة من إقليم السافنا لمقارنة وتعميم النتائج.