Can commercialization of NTFPs alleviate poverty? A case study of *Ricinodendron heudelotii* (Baill.) Pierre ex Pax. kernel marketing in Cameroon

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Abstract

Ricinodendron heudelotii (Baill.) Pierre ex Pax. kernel (*njansang*) commercialization has been promoted by the World Agroforestry Centre (ICRAF) in project villages in Cameroon with the aim to alleviate poverty for small-scale farmers. We evaluated to what extent development interventions improved the financial situation of households by comparing project and control households. The financial importance of *njansang* to household livelihoods between 2005 and 2010 was investigated through semi-structured questionnaires with retrospective questions, focus group discussions, interviews and wealth-ranking exercises. The importance of *njansang* increased strongly in the entire study region and the increase was significantly larger in project households. Moreover, absolute numbers of income from *njansang* commercialization as well as relative importance of *njansang* in total cash income, increased significantly more in project households ($p < 0.05$). Although the lower wealth class households could increase their income through *njansang* trade, the upper wealth class households benefited more from the projects' interventions. Group sales as conducted in project villages did not lead to significantly higher prices and should be reconsidered. Hence, promotion of *njansang* had a positive effect on total cash income and can still be improved. The corporative actors for *njansang* commercialization are encouraged to adapt their strategies to ensure that also the lower wealth class households benefit from the conducted project interventions. In this respect, frequent project monitoring and impact analysis are important tools to accomplish this adaptation.

Keywords: NTFP, *Ricinodendron heudelotii*, market, commercialization, rural development, income, Cameroon

Abbreviations
NTFP (Non-Timber Forest Product)
ICRAF (World Agroforestry Centre)

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1 Introduction

Non-Timber Forest Products (NTFPs) have been harvested for subsistence and trade for thousands of years and their importance has been demonstrated by various authors (Neumann & Hirsch, 2000; Marshall *et al.*, 2006). They have proved to be of great value for rural communities in their daily diet as well as providing cash income to cope with their daily needs (Pimentel *et al.*, 1997). The importance of NTFPs has never been denied, but the real boost came after the United Nations Conference on Environment and Development (UNCED) in

Rio in 1992 where the potential of NTFPs and their commercialization was officially acknowledged. NTFPs have been widely promoted ever since. The commercialization of NTFPs has the potential to combine economical and ecological benefits (Neumann & Hirsch, 2000); it can enhance economical development and alleviate poverty in combination with the conservation of natural ecosystems (Arnold & Ruiz Perez, 1996).

Chupezi *et al.* (2009) stated that livelihoods of farmers can be improved by assisting local communities to commercialize their NTFPs. According to these authors, local support should improve institutional arrangements, promote the implementation of available policies, improve technologies and transport infrastructure for processing and marketing, and enhance information flows. Against this background, numerous projects to promote the commercialization of NTFPs have been supported by non-governmental, national and international organizations (Neumann & Hirsch, 2000). Although promotion of NTFP commercialization in theory seemed straightforward, in practice, it turned out to be a challenge (Belcher & Schreckenberg, 2007). Several drawbacks and obstacles were encountered and many projects did not deliver the expected outcomes and successes (Neumann & Hirsch, 2000). In order to overcome these drawbacks the impact of development projects that focus on NTFP commercialization need to be evaluated properly. External organizations and promoters, who want to be informed about the actual changes resulting from their financial inputs, are interested in thorough impact assessments (Maredia, 2009). There is still a lack of reliable data on the impact of development programs and the used measuring methods and analysis have remained almost purely theoretical (Savedoff *et al.*, 2006; Maredia, 2009). The impact of NTFP commercialization on farmers' livelihoods in particular has rarely been assessed nor documented in literature, with the exception of a few studies in Latin America (Marshall *et al.*, 2006).

In Cameroon, development and research organizations promote the commercialization of NTFPs. One of the most important NTFPs in Cameroon, as recognized by farmers, are the kernels of *Ricinodendron heudelotii* (Baill.) Pierre ex Pax., locally known as *njansang* (Mollet *et al.*, 1995; Plenderleith, 2004). *R. heudelotii* is a long-lived pioneer tree species from tropical forest and is distributed from Upper Guinea across to East Africa (Poorter *et al.*, 2004). Its fruits (2–3 lobed, 2×3 cm, indehiscent) are primarily dispersed through gravity and, when fallen on the ground, are frequently collected by farmers. Further processing involves rotting of the fruit pulp, washing the stony endocarp, cracking of the endocarp in boiled water followed by the (manual or mechan-

ical) extraction of kernels, and finally drying of kernels (Tchoundjeu & Atangana, 2006). Ground kernels are used as thickening ingredient in soups and stews after crushing (Fondoun *et al.*, 1999). Trade of kernels provides cash income for many households (Ayuk *et al.*, 1999). They are traded on local, national and, to a lesser degree, international markets (Plenderleith, 2004). Production and market availability of kernels is seasonal and this is reflected in fluctuating market prices (Ayuk *et al.*, 1999). In general, there is a doorstep selling of the kernels (Ndoye *et al.*, 1997). The current tendencies of increased consumption of *njansang* in the cities in West and Central Africa (Manirakiza, 2007; Plenderleith, 2004) and the increased importance on international markets (Plenderleith, 2004) indicate a promising potential for this product.

The main objective of this study is to evaluate the impact of a development project on farmers' financial situation. The studied development project, led by the World Agroforestry Centre (ICRAF), focused on *R. heudelotii* kernel (*njansang*) commercialization in the tropical humid forests of Cameroon. The study also investigates to what extend the poorest households benefited from the project interventions.

2   Study sites

Field work was conducted in the moist forest zone of Cameroon, located between 3°52' – 4°20' N and 11°57' – 12°30' E in the Nyong-et-Mfoumou department. The region is characterized by a mean annual temperature of 25°C. Rainfall distribution is bimodal with an average between 1500–2000 mm year^{-1}, a rainy season from mid-March to mid-July and another one from mid-August to mid-November. The region is mainly covered by primary and secondary evergreen forest (Nakuna Tsala, 2009). Cropping systems consist of fallow-based food crop production (shifting cultivation), multistrata homegardens and semi-permanent, cash crop production of mainly cocoa (*Theobroma cacao*) and lowland coffee (*Coffea canephora*).

Within anthropogenic landscapes, *R. heudelotii* is most common in the semi-permanent cash crop production system and in bush fallows (Fondoun *et al.*, 1999). The tree species typically appears on abandoned farmland and is often retained when land is cleared and agroforestry systems are established because it improves soil fertility and provides shade (Tchoundjeu & Atangana, 2006; Plenderleith, 2004). It is scarce in primary forest but occurs regularly in transition forests (Plenderleith, 2004).

Cocoa and coffee, the two major cash crops for smallholders in Cameroon, constitute the only cash income

Table 1: *General characteristics of sampled villages.*

Name village	Closest city with urban market	Distance to urban market (km)	ICRAF marketing project	Year of 1st group sale	Sampled households (n)	Coverage of total households (%)
Epkwassong	Akonolinga	96	Yes	2005	26	30%
Nyamvoudou	Akonolinga	90	No	–	29	6%
Ondeck	Akonolinga	61	Yes	2005	29	13%
Abamyendjock	Akonolinga	56	No	–	30	16%
Ebassi	Yaoundé	60	Yes	2009	21	32%
Omgbwang	Yaoundé	65	No	–	23	64%

for many households. However, due to the drastic reduction in world prices of cocoa and other commodities in the late 1980s, farmers started to increase staple production and diversify their livelihood strategies to compensate for the lost income (Sunderlin *et al.*, 2000). Commercialization of NTFPs, such as *njansang*, was one of the strategies to gain an additional income (Ayuk *et al.*, 1999).

We chose three villages where ICRAF marketing projects and partners were active at the time of the present study. These projects aimed to increase, diversify and stabilize incomes of poor small-scale farmers through increasing their participation and benefits from agroforestry tree products' value chains. In the study area, the focus was on the domestication of *R. heudelotii* and commercialization of its kernels. The main project interventions were: 1) setting up institutional marketing arrangements by organizing farmers involved in *njansang* commercialization in producer groups; 2) installation of a market information system which had to provide the producer groups with up-to-date market information as well as to increase their bargaining power, and establish links between producers and traders; 3) technical support for product processing to reduce the labour-intensive processing activities (was still in a test phase); and 4) the establishment of a village nursery to stimulate the domestication process and planting trees on farms. In practice, many of these activities focused on increasing incomes for farmers through *njansang* commercialization. Moreover, farmers customarily selling *njansang* independently, agreed to bulk and sell their products conjointly. To this respect, producer groups were introduced to traders at several market places (e.g. Yaoundé, Douala, Akonolinga). Depending on the available bulked quantities of *njansang*, producer groups negotiated over the phone with several traders to reach a trade agreement, including price setting as well as other marketing and logistic aspects. At the time of this study, ICRAF was still monitoring the projects, but the long term goal was to produce and work independently.

3 Materials and Methods

Based on the inclusion or exclusion of a marketing project conducted by ICRAF and partners, stratified sampling was done at village level. Three villages were selected in each stratum. We first selected three 'project villages' that benefited from a marketing project. We then selected three 'control villages' (Table 1) which featured a similarity of socio-economic characteristics that could influence the commercialization of *njansang*. Hence project and control villages were similar at the time of initial project implementation; particularly with regard to *njansang* commercialization.

Data were collected from October to November 2010. Within each village, households were randomly selected from all households active in *njansang* commercialization. A total of 158 households within six villages were studied. On household level, data were collected using semi-structured questionnaires. Here, household financial data were collected using retrospective methods according to guidelines by Cavendish (2002) and Omilola (2009). Questions focused on two production years, namely 2005 and 2010; whereby the first represents the era before any project intervention.

The change in household's income, that was obtained through marketing *njansang* between 2005 and 2010, was collected applying three methods: 1) absolute income data from *njansang* sales; 2) relative importance of *njansang* in total cash income; and 3) an auto-evaluation by the farmer on the change of income from *njansang* over this period. Absolute income data were calculated from quantities sold and prices received in 2005 and 2010. Additionally, household's type of commercialization technique for these two years were collected. Relative importance of *njansang* to total cash income was collected using a weighing exercise as described by Termote *et al.* (2010, 2011). Farmers first summed up their cash-generating activities and subsequently distributed 40 units (nuts or small stones) among these activities according to their contribution to the total cash income. This exercise was done for cash

Table 2: *Absolute income from njansang commercialization.*

	Median 2005 (USD) *	*Middle 50 % (between quantiles 1/3) (USD)*	*Median 2010 (USD) **	*Middle 50 % (between quantiles 1/3) (USD)*	*Median Change 2005-2010 (USD) **
Project households	36.7[a]	14.7–117.3	73.3[a]	40.5–123.9	21.9[a]
Control households	41.6[a]	19.6–97.8	61.0[a]	31.3–93.8	18.6[b]

* Different superscripts indicate significant differences

incomes in 2005 and 2010. For the third measure, farmers had to auto-evaluate the change in *njansang* income between 2005 and 2010 on a 5-point Likert-item. The scores on the Likert-item went from –2: a large decrease, over –1: decrease, 0: no change, 1: increase, to +2: a large increase. To assess the change in total cash income over the observed timeframe, farmers auto-evaluated this change on an identical Likert-item. Data on production costs, quantities, commercialization periods and prices were also collected, again pertaining to 2005 and 2010.

Additional data were collected using participatory approaches at village level according to the guidelines from Schreckenberg *et al.* (2005). More specifically, focus group discussions and interviews with key-informers focused on trends and changes within the village which were attributed to *njansang* commercialization, while participatory wealth-ranking provided information about the wealth status of households. The latter exercise was conducted with four farmers separately (two men and two women). Therefore, farmers who were familiar with all the households were selected. To avoid data bias, farmers had to have a different wealth status. The exercise involved four steps: 1) farmer's description of wealth indicators; 2) grouping the involved households over five wealth classes; 3) explaining general characteristics of each class; and 4) final revision and possible reclassification of each household.

3.1 Data analysis

Statistical data analysis was done with SPSS Statistics 17.0 (SPSS Inc., 2008, Chicago). Parametric tests were used when appropriate, however the majority of statistical tests were non-parametric. Household data of project villages were pooled and tested against pooled household data from control villages. Another approach of data pooling was based on the types of houshonds' commercialization techniques which depended upon the location of product trading and trading practices (if the product was traded individually or conjointly with a group). Here, four trading practices were distinguished:

1) individual trade at home; 2) group trade at home; 3) individual trading at a market outside the village and; 4) combination of 2) and 3).

Household's wealth-ranking scores that were obtained during the wealth-ranking exercises were used for the poverty analysis. Based on increasing wealth scores gathered in 2010, households were divided in three groups, namely: 1) lower; 2) middle; and 3) upper wealth class.

Local units to measure quantities, such as cups or glasses, were converted to kilograms. However, due to the variation between the units that were used as well as traders' and farmers' personal measuring methods, the quantity data are assumed to contain minor measurement errors.

The change of absolute income from *njansang* commercialization between 2005 and 2010 featured continuous data. For comparison with farmers' auto-evaluation of their income evolution, these data were reduced to nominal data by grouping them into six groups: 1) negative change of income; 2) positive change: less than 1 $ day^{-1}; 3) less than 2 $ day^{-1}; 4) less than 5 $ day^{-1}; 5) less than 10 $ day^{-1}; and 6) more than 10 $ day^{-1}.

To compare data from 2005 and 2010, present values were calculated for absolute income and price data with 2010 as reference year. The applied inflation rate was based on the mean annual inflation rate in Cameroon between 2005 and 2010, namely 2.56 %. Data from 2005 were calculated accordingly. A currency exchange rate of 1 dollar (USD) to 468 FCFA (XAF) was applied (06-03-2011).

4 Results

4.1 Absolute njansang income

Absolute income from *R. heudelotii* was characterized by a large variability between households (Table 2). In 2010, the *njansang* revenues per household per year ranged between 2 and 860 USD, while 50 % of

the households gained between 30 and 108 USD. Incomes in 2010 were significantly higher than those in 2005 for both project and control households ($p = 0.002$ rsp. $p = 0.019$). The income growth of project households was stronger than those of control households ($p = 0.049$). Nevertheless, in 2005 and 2010 there was no significant difference in the absolute *njansang* income between project and control households.

4.2 Relative importance of njansang commercialization

In 2010 at least 70 % of households in each village were involved in *njansang* commercialization. In 2005, *njansang* commercialization used to be less common in all villages, especially in project villages where few households had been involved in this activity (Table 3).

Table 3: *Percentage of households involved in the commercialization of R. heudelotii kernels.*

	Mean in 2005 (%)	SD * (%)	Mean in 2010 (%)	SD * (%)
Project villages	30	20	93	12
Control villages	73	25	83	15

* Standard Deviation

In 2005, the relative importance of *njansang* to total cash income was significantly lower in project households as compared to the control households (Table 4). In 2010, there was no difference between project and control households, while in both sets of villages the relative importance of *njansang* increased to about 20 % of total cash income. Thus, a significant increase of the financial importance of *R. heudelotii* kernels was observed in both project and control households, although the increase for project households was significantly larger than for control households. Taking into account that in 2005 the degree of integration into *njansang* value chain differed between project and control households, we focused on the changes of the parameter values.

With the exception of Omgbwang, all villages showed a significant increase of the relative importance of *njansang* to total household income.

4.3 Households' auto-evaluation of income changes

The households' auto-evaluation of yearly income from *njansang* commercialization on a 5-point Likert-item showed a more pronounced trend. Project households featured mean scores of 1.16, with 1 indicating

an 'increase' and 2 a 'large increase'. Control households featured a significantly lower mean score (0.46; $p < 0.001$). Only 10 % of project households had a score of zero or below, indicating 'no change' or a 'decrease' in *njansang* income. In control villages, 28 % perceived 'no change' and 17 % a negative change. Project households clearly indicated that their income from *R. heudelotii* kernels sales had increased between 2005 and 2010, while the opinions of respondents from the control villages diverged.

An auto-evaluation of the households' total yearly income was also done on a 5-point Likert-item. A small but significant ($p < 0.001$) positive trend between 2005 and 2010 was observed for both project and control households with mean scores of 0.70 and 0.32 respectively. However, comparing both groups did not show a significant difference. Spearman rank correlations within project ($r = 0.52$) and control households ($r = 0.59$) ($p < 0.001$), revealed a positive relationship between auto-evaluation of total income and the auto-evaluation of *njansang* income. In control villages, 57 % of the households linked their increased income to the commercialization of *R. heudelotii* kernel. In project villages 90 % of the households made this connection between income and product commercialization.

The auto-evaluation results of the change in *njansang* income were compared to two more objective parameters: the change in absolute data from *njansang* income and the change in importance of *njansang* income to total cash income. All parameters were significantly correlated (Table 5). Correlations involving the auto-evaluation of *njansang* income were lower for project than for control households.

Further, auto-evaluation of *njansang* income was combined with the change in absolute *njansang* income data between 2005 and 2010. For this purpose, the latter parameter was divided into six groups. These groups were then analyzed in a frequency table which showed a significant linear-by-linear association with the auto-evaluation. The association was stronger for control households than for project households ($p = 0.002$ rsp. $p = 0.015$). The frequency table showed that a similar change in absolute *njansang* income was perceived differently by project and control households. For example, perceptions of project and control households whose income from *njansang* increased with less than 1 USD day^{-1}, were compared (Fig. 1). Whereas 90 % of the project households perceived the increase of less than 1 USD day^{-1} as an 'increase' or 'large increase' on the Likert-item, only 50% of the control households perceived this change as an 'increase', while 40 % indicated 'no change'. Thus, project households evaluated a similar absolute difference in income higher on the Likert-item than control households.

Table 4: *Relative importance of njansang commercialization to households' total cash income.*

	Median 2005 (%)	p-value	Median 2010 (%)	p-value	Median Change 2005-2010 (%)	p-value ($H_0=0$)	p-value
Project households	12.4	0.019	21.1	0.810	8.9	<0.001	0.045
Control households	15.0		20.0		5.0	<0.001	
Epkwassong	5.0	0.031	19.8	1.000	14.0	<0.001	0.011
Nyamvoudou	15.0		20.0		5.0	0.019	
Ondeck	5.0	0.172	16.0	0.144	12.1	0.005	0.036
Abamyendjock	10.0		15.0		5.1	<0.001	
Ebassi	15.0	0.001	20.0	0.036	2.7	0.014	0.033
Omgbwang	24.0		23.1		0.0	0.287	

Table 5: *Spearmann rank correlations between three different measures of households' income evolution from njansang (2005–2010).*

		Change absolute income		Change relative importance
Change relative importance	Project:	0.34**		
	Control:	0.27*		
Auto-evaluation evaluated on Likert-item	Project:	0.26*	Project:	0.24*
	Control:	0.42***	Control:	0.41***

* significant on the 0.05-level, ** significant on the 0.01-level, *** significant on the 0.001-level
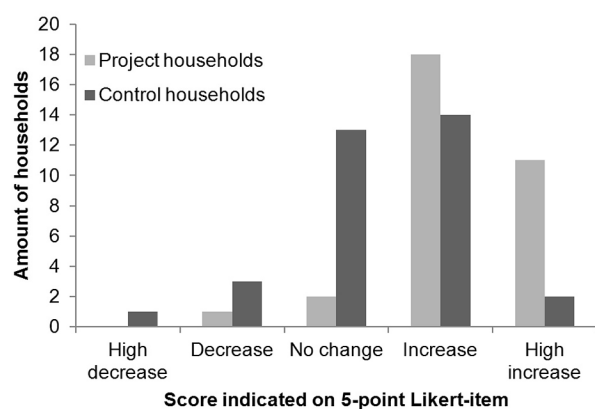
Fig. 1: *Auto-evaluation of change in njansang income (between 2005–2010) by an absolute income change between 0–1 USD*

4.4 The relationship between quantities, prices and commercialization techniques

Changes in income were compared to changes in prices and quantities of the traded product. The mean income from *njansang* increased from 2005 to 2010. In this case, increase can be linked to several factors and most of them will be reflected in a change of quantity and/or price of the traded product. First, considering the marked seasonal availability of *njansang*, the influence of commercialization period was investigated. In 2005, both project and control households sold their products between December and February (medians). In 2010, project and control villages showed significant differences between the month in which households started selling their product and the month in which they sold for the last time. A difference of about two months was observed ($p < 0.001$), with project households starting and finishing trading their product mainly between February and April (medians) while control households sold between December and February (medians). The temporal shift of *njansang* commercialization within the project households' had no impact on prices. Further-

more, no significant differences between the minimum, maximum or mean prices could be observed between project and control households in 2005 and 2010. However, between 2005 and 2010 there was a significant increase of minimum and mean prices within project and control households ($p < 0.05$). On the other hand, no significant difference between the price increase in project and control households could be detected (Fig. 2). Prices did differ with farmers' commercialization techniques. Households that sold their product in a market outside the village, received significantly higher prices than those who sold the product to traders, coming to the village ($p = 0.023$). However, for households trading in the village, no significant difference between either group or individual sales could be observed. Thus, the mean price of 2.48 USD kg^{-1} by group sales during 2010, did not significantly differ from the mean price that was obtained through individual trading (2.43 USD kg^{-1}).

Fig. 3: *Applied commercialization technique (2010) and its impact on mean quantities of njansang commercialized: 1) individual trade at domicile; 2) group trade at domicile; 3) individual trade at market outside the village; and combination of 2) and 3) (bars represent standard deviations, different letters indicate significant differences only within a specific commercialization technique)*
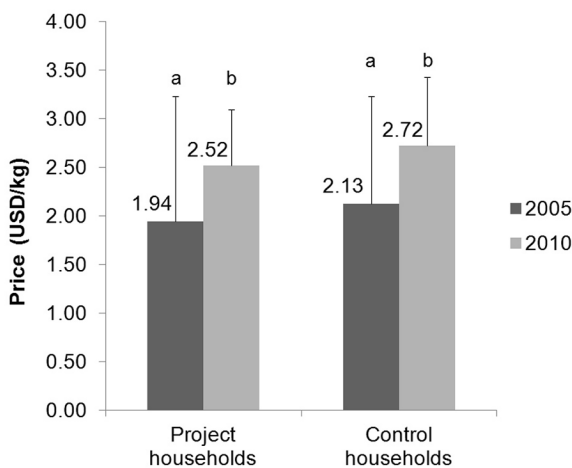

Fig. 2: *Mean prices received for njansang (bars represent standard deviations, different letters indicate significant differences)*

Traded quantities of *R. heudelotii* kernels increased significantly between 2005 and 2010, in project as well as in control households ($p = 0.021$ and $p < 0.001$). Between project and control households no significant difference was detected. With regard to households' commercialization technique, farmers selling *njansang* in markets outside the village traded significant larger quantities per year (Kruskal Wallis post-hoc tests, $p < 0.05$). Although farmers commercializing at village traded smaller quantities, they increased significantly their traded quantity between 2005 and 2010 ($p < 0.05$, Fig. 3).
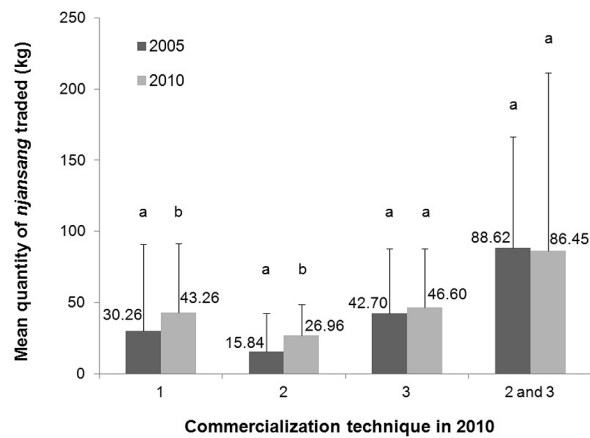
Between 2005 and 2010, there was a significantly positive correlation between traded quantities and absolute income from *njansang* commercialization in project and control households ($r = 0.60$, $p < 0.001$ rsp. $r = 0.61$, $p < 0.001$). Also, changes in prices were significantly correlated with changes in *njansang* income, but the correlation coefficient was smaller and the significance weaker ($r = 0.23$, $p < 0.01$; $r = 0.20$, $p = 0.04$ for project and control households respectively).

4.5 Income changes and wealth status of households

There was no relationship between participatory wealth-ranking score and absolute *njansang* income for project and control households in 2005 and in 2010. Based on wealth-ranking scores, three wealth classes were created. In project villages, the middle class gained the highest income from *njansang* commercialization in 2005, but this changed between 2005 and 2010 with the wealthier classes participating increasingly in this activity and *njansang* revenues increasing significantly more for project households of the highest wealth status (Table 6). In 2005, the upper and middle class households were involved only to a limited degree in the commercialization of this product. Thus, as a consequence of the project intervention, a significant difference in income from *njansang* between the lower and the middle to upper wealth class group could be observed in 2010, whereas the difference was not significant in 2005.

Table 6: *Household's yearly income from njansang commercialization between different wealth classes in project villages.*

Wealth class (2010)	Median income 2005 (USD) *	Median income 2010 (USD) *	Median change income (USD) *
Lower	14.7 [a]	32.3 [a]	18.3 [a]
Middle	67.3 [c]	83.7 [b]	18.6 [a]
Upper	45.2 [a,c]	148.7 [b]	89.7 [b]

* Different superscripts indicate significant differences between wealth classes
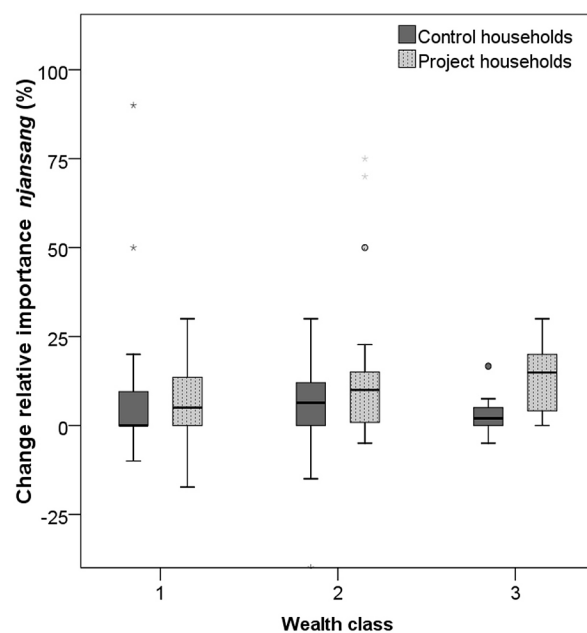
Fig. 4: *Boxplot of the change in relative importance of njansang to households' total cash income between 2005 and 2010. Households were grouped in wealth classes of increasing wealth: 1) lower; 2) middle; and 3) upper wealth class.*

Considering the relative importance of *njansang* to total cash income, a similar change could be observed (Fig. 4). Within the project villages, a negative relationship between relative importance of *njansang* revenues and the wealth-ranking score was evident in 2005 ($r = -0.31$, $p = 0.010$), but not in 2010 ($r = -0.03$). In contrast to the project villages, all wealth classes within control households were involved to a similar degree in *njansang* trade and evolved also similarly between 2005 and 2010. Lower-wealth households in the project villages initially had lower financial gains than their respective counterparts in control villages, but his changed with time and both groups were at the same level in 2010.

5 Discussion

5.1 Do interventions to promote NTFP commercialization help?

The present study could show that project interventions to promote *njansang* commercialization helped the households to integrate faster and attain higher financial benefits from its commercialization than their controls. This was reflected in the stronger growth of *njansang*'s absolute income, contribution to total cash income, and through farmers' auto-evaluation. Furthermore, an increase in household total income was often linked to the commercialization of *njansang*, particularly within project households. Project households had become more involved and featured higher gains, even though not all financial parameters were significantly different between project and control households. However in 2005, project villages were less-integrated in the value chain of *R. heudelotii* kernels than control villages and the observed economic benefits might have been easier to attain in project villages as marginal cost probably increase when larger quantities are commercialized.

5.2 The importance of njansang commercialization

Our study could show that commercialization of *R. heudelotii* kernels is of high economic importance for households in project and control villages, and probably for the whole region. In 2005, project villages were less involved in the commercialization of *R. heudelotii* kernels than the control households. This was demonstrated by the different percentages of involved households between project and control villages (Table 3) and the different financial importance of selling this target product (Table 4). The contribution of *njansang* to total household cash income of 5–10 % in 2005 was already reported by Sunderland *et al.* (2003). Compared to other studies in the humid forest zone of Cameroon, the contribution of *njansang* commercialization to total cash income within project and control households was high (10–25 %). For example, Sunderland *et al.* (2003) mentioned a value of 6.6 % for the contribution of *njansang* to household total cash income whereas Lescuyer (2010) found that all NTFPs in total, contributed only 5 % to total cash income. In the present study, the high economic importance of *njansang* is probably induced by the high demand for the product in this region. This high demand in turn is linked to the proximity of large urban markets. The most remote sampled village was located less than 100 km from the country's capital. The relationship between a higher demand for *R. heudelotii* kernels and geographical location as well as the proximity to urban areas and their markets was shown by Peach Brown & Lassoie (2010). Among others Neumann & Hirsch (2000)

stated that geographical location influences the importance of NTFPs' contributions to households' incomes. This could be also proofed for the villages Omgbwang and Ebassi. They are located next to the capital and showed the highest economic importance of *njansang* commercialization.

The present study could also show that the importance of *njansang* as a source of income increased over the years in all sampled villages and probably in the whole region (Table 3 and 4). As indicated by Plenderleith (2004), Tieguhong & Ndoye (2006) and Manirakiza (2007) this trend can be explained by the increasing demand for *njansang* on local, national and international markets. In contrast to our results, Lescuyer (2010) indicated a decline of the importance of NTFPs to households' income in Cameroon. The results of our study differ from Lescuyer's (2010) which might be partly explained by the geographical location of the study, which was conducted within more isolated regions in Cameroon.

5.3 Increased income, a matter of prices or quantities?

Prices and price increase did not differ between project and control villages although differences were expected due to: 1) the difference in commercialization period between project and control households combined with the seasonal dynamics of the demand-supply curves throughout the year (Ndoye *et al.*, 1997; Ayuk *et al.*, 1999; Plenderleith, 2004) and 2) the presence of a producer group applying commercialization strategies that increase bargaining power and consequently the prices and income from their product (Ndoye *et al.*, 1997). Households that sold their product to markets outside the village received significantly higher prices and traded larger quantities. Although these households received higher prices, trading in urban markets meant additional cash expenses due to transportation costs and payment of market fees. Particularly transportation costs are very high and depend to a large extent on the distance to the market and state of the road. Farmers rarely travel to urban markets for the exclusive goal of selling *njansang* and with regard to the small quantities, kernels were often transported without extra costs. On the other hand, in project villages, households did not bear the cost of marketing outside the village, but as member of the producer group, they had to pay admission fees and yearly contributions.

The determined mean prices for *njansang* of 2.1 USD kg^{-1} (2005) and 2.6 USD kg^{-1} (2010) are higher than the mean prices mentioned by Ayuk *et al.* (1999) reaching a maximum of only 1.2 USD kg^{-1} (adjusted price with inflation rate of 2.56%). Although Ayuk *et al.* studied more remote areas in Cameroon; the large price

difference confirms the increase of *njansang*'s economic value in Cameroon. The enhanced income in 2010 was mainly related to an increase in traded products and to a lower extent to an increase in price. Whereas Ayuk *et al.* (1999) reported quantities of 20 kg per household per year, our study confirms that households trade quantities around 40 kg per year. Although this difference might be caused by differences in natural availability of the species, it presumably refers to a more intensive exploitation of the product by the farmers in this region.

5.4 Omgbwang: a village with special characteristics

Omgbwang village had a longer *njansang* commercialization tradition than the other villages. In 2005 the knowledge of the product's potential and contribution to cash income was already widespread throughout the village, with all households commercializing *njansang*. The importance of *njansang* to households' total cash income and its absolute income did not change in Omgbwang between 2005 and 2010. This could demonstrate that the commercialization in this village had already reached its 'full' potential in 2005 and possibly stagnated due to constraints in resource availability and high opportunity costs to harvest, process and trade.

Before the start of the production season, inhabitants of Omgbwang made a yearly agreement about the minimum unit price they should obtain when commercializing *njansang*. This feature of spontaneous price setting by producers was not observed in other villages, where prices were mainly imposed by traders. Although both villages Ebassi and Omgbwang are located next to capital, the price fixing in Omgbwang might be linked to the households' long experience in *njansang* commercialization. And in contrast to Ebassi, the road through Omgbwang serves as a passage to more remote villages and as an entrance to the northern area.

An early increase in amount of households commercializing *njansang* in particular villages could be attributed to the known presence of early adopters commercializing *njansang* in Omgbwang and the subsequent involvement of other households. Another important reason for households to start commercializing *njansang*, was the high demand by traders, making the farmers aware of the value of *njansang*.

5.5 Pro-poor development?

As confirmed in this study, NTFPs are known to play an important role in the livelihoods of the poor because they are among the few cash-generating activities with sufficiently low entry requirements for poor people to access (Marshall *et al.*, 2006). However, the integration and importance of a NTFP for households largely depends on type and specific characteristics of

the product under consideration. If the production and commercialization of the product requires financial inputs, this product is more likely to benefit households with larger incomes who can afford to invest (Marshall *et al.*, 2006). Commercialization of *njansang*, although labour-demanding, does not require much cash input and is thus accessible to all wealth classes. Nevertheless, the promotion and organization, as is has been induced by the project, implied additional costs for the producers. Although the costs are very small, focus group discussions indicated that the costs discouraged some households from participation. Besides this, the largest benefits of the project interventions were captured by the wealthier households.

5.6 Assessment of income changes

The change in income from *njansang* commercialization on household level between 2005 and 2010 was evaluated through two objective parameters, namely: change in relative importance of *njansang* to total cash income, and the change in absolute *njansang* income data; as well as a subjective parameter, namely: auto-evaluation on a 5-point Likert-item. The subjective interpretation showed more significant differences between project and control households than the absolute income data and it produced thus a more positive image of the project intervention. Hence, similar increases in absolute income were evaluated higher on the Likert-item by project than by control households. In addition, the correlation coefficients between the objective and subjective parameters were higher for control households.

It cannot be stated that the objective, direct measuring method is preferred above the subjective one based on farmer's perception. On the one hand the subjective method is based on the judgment of people and this could have been influenced on multiple levels. Farmers could have paid less attention to the actual impact and contribution of the product in the past, and could thus perceive a larger change and higher gains than actually occurred. Moreover, the project interventions in this study possibly brought among others improvements of livelihood such as social (e.g. producers groups, social cohesion) and human assets (e.g. capacity building, self-esteem). Although the questions specifically focused on income, improvements of other livelihood assets might also have influenced respondents' answers. In addition to this, the occurrence of 'conspiracy of courtesy' as stated by Menton *et al.* (2010) wherein respondents attempt to please the interviewer by giving what they perceive to be the desired answer, cannot be excluded. Even though the necessity of objectivity was clearly explained at the beginning of each interview, the authors got in contact with the sampled households

through the project managers and households which might have influenced their responses with the idea of 'conspiracy of courtesy' towards the project or for perceived personal reasons or gain. For example, farmers in Epkwassong concealed certain positive changes such as television and DVD player. Probably, farmers feared that the development project would stop its interventions once these positive changes were detected. Nevertheless, some of this information was revealed during focus group discussions, showing the importance of participatory techniques to complement surveys as mentioned by Menton *et al.* (2010). On the other hand, absolute data on *njansang* revenues were only available from two years and although *R. heudelotii* is known as a regular fruit producer, fruit production does vary between years and regions (Plenderleith, 2004). Another aspect in favour of the subjective assessment is that farmers' estimates of absolute quantities and their derived incomes can be very inaccurate (Menton, 2006 as mentioned by Menton *et al.*, 2010). In the case of this study, we suspect some changes from *njansang* commercialization remained undetected due to the high variability in local measuring devices and methods, as well as the problems of retrospective data accuracy (see Menton, 2006; Bernard *et al.*, 1984). Based on the higher correspondence between objective and subjective parameters for control households, the actual economic impact of *njansang* commercialization in project households might be overestimated.

However, subjective data could yield a biased image of the situation and in a further stage they should be corroborated by quantitative, more objective data, whereas quantitative data should be recorded continuously to overcome problems in variation of yearly fruit production and minimize retrospective errors.

6 Conclusions

Ricinodendron heudelotii (Baill.) Pierre ex Pax. kernel commercialization is an important income generator for the households in the Nyong-et-Mfoumou department, Cameroon. Its contribution to the households' financial situation increased between 2005 and 2010. Farmers have increased the amount of *njansang* traded and prices increased as well. Project interventions to improve *njansang* commercialization assisted the involved households and villages to develop at a higher pace than the rest of the region. The interventions had a significant financial impact on the poorest and wealthiest households, but profits gained by the wealthier were clearly higher. Although at the beginning of a development project, poorer households are often targeted, it is indispensable to keep them involved

all along and ensure that they capture the generated benefits. Hence, it is vital to closely monitor project interventions and its outcomes and adapt strategies if necessary.

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