



Relationship between local ecological knowledge and natural resources trade in Sudan

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Abstract

This study was conducted to investigate the local community ecological knowledge and the household's tradeoff between coping strategy and natural resources management. Sixty households were purposively selected from two study sites for three household groups (10 households/group/site); non-trading, inexperienced trading, and experienced trading in South Kordofan and the Blue Nile States. The study results revealed a strongly significant difference in the distribution of LEK between trading households in the two states. The study results also showed a significant difference in the households' choice of coping strategies across LEK levels in both South Kordofan State ($\chi^2=107.0$; $p<0.0001$) and Blue Nile State ($\chi^2= 1.9$; $p<0.001$). The study concluded that trading households have superior levels of LEK in relation to non-trading households across the two states, and the level of LEK is crucial to households' choice of coping strategy in response to shocks.

Keywords: LEK; Natural Resource Trade; Gender Differentiation; Trader Groups; Coping Strategy, Sudan

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Cite this article as: Adam, Y.O. and Bello, A.R.S. (2017), "Relationship between local ecological knowledge and natural resources trade in Sudan", *International Journal of Development and Sustainability*, Vol. 6 No. 7, pp. 385-398.

1. Introduction

Local ecological knowledge (LEK) is defined by Berkes et al. (2000: 24) as “a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment”. Its levels within a community are therefore dependent upon demographic factors like gender, age, kinship relations, ethnicity, position in a social network and distance from natural resources (NRs) or cities (Quinlan and Quinlan, 2007; Souto and Ticktin, 2012; Mmassy and Roskaft, 2014). LEK is consequently shared over time among users of a particular resource (Agrawal, 1995; Berkes et al., 2000; Kota and Shackleton, 2015). However, gender is perceived to play an important role in the LEK held by individuals (Lado, 2004; Dovie et al., 2008; Singh et al., 2010; Iniesta-Arandia et al., 2015), and this ultimately had an influence on the overall differences in LEK held by natural resources (NRs) trading and non-trading households (Weyer and Shackleton, 2011).

Previous literature has found variable results, with some reporting males holding higher LEK, others finding females do so and others concluding that there is no difference (Dovie et al., 2008; Gouwakinnou et al., 2011). Pattanayak and Sills (2001) found, in the Brazilian Amazon, that households, who had been living in their communities within the forest for longer, took more forest collection trips. In concert with this, McSweeney (2005) commented that more established households with deeper reservoirs of knowledge relied more on natural resources (NRs) as a safety-net. However, other authors reported that LEK is a restrictive factor to harvesting and use of NRs products as safety-nets (e.g. Mutangadura et al., 1999; Pattanayak and Sills, 2001; De Waal and Whiteside, 2003; Drimie and Grandure, 2005; Paumgarten, 2005; Torell et al., 2006; Kaschula, 2008) and the increased use of NRs should boost the levels of LEK (e.g. Uma Shankaar et al., 2004; Mmassy and Roskaft, 2014). Godoy et al. (1998) found that the sale of forest goods is associated with superior knowledge of wildlife than those selling crops or who are engaged in wage labour.

According to McSweeney (2003) levels of LEK therefore potentially play a role in household's choice of coping strategy in response to shocks as safety-net. But households respond to shocks in different ways depending on the resources they have available to them (Pattanayak and Sills, 2001; De Waal and Whiteside 2003; Dekker, 2004; Mutenje et al., 2010; Gomez-Baggethun et al., 2012) and when some degree of success is achieved from the resource use (Shackleton and Shackleton, 2006; Shackleton et al., 2008). However, in Sudan the information on LEK and natural resources trade as well as the household choice of coping in response to shocks is scant. Thus, the purpose of the study was to bridge the knowledge gap between the local ecological knowledge (LEK) and the degree to which it contributes to the expansion of natural resources (NRs) trade as well as the household's choice of coping strategy in response to shocks.

2. Methodology

2.1. Study areas

South Kordofan State lies between latitudes 9° and 12° N; longitudes 27° and 32° E., and covering an area of 13.44 million ha (Ballal et al 2014). Vast areas of the state are covered with hill catena intersected by seasonal watercourses, valleys, and depressions where fertile alluvial soils deposition occurs seasonally. The main soil type is vertisols, so-called cracking clays, in addition to sandy clay soils, locally known as gardud, which has a hard crust that hastens water runoff. Sandy soils characterize the northern parts of the State. The mean annual rainfall ranges from 350 mm in the north to 850 mm towards the southern boundaries of the state (Ballal et al 2014). The rainy season extends from mid-May to mid-October, and annual rainfall ranges from 400 to 800 millimeters (16.4 to 32.8 in), allowing grazing and seasonal rain-fed agriculture (http://en.wikipedia.org/wiki/Nuba_Mountains, 2014). Sandy soils dominate in the western and northern parts of the region. Based on these physical characteristics, the region has been a major economic base for the Sudanese agrarian economy; the recently discovered and exploited rich oil fields in its western part have made it even more significant, economically, politically and strategically (Bello, 2014).

Blue Nile State is located in the south-east of Sudan. The State borders Sinnar State from the North, Ethiopia from the East and South, White Nile state from the West and Upper Nile State from the South West. It extends from latitudes 12° 40" to 9° 20", and from longitudes 35° 10" to 33° 30". It has an area of 38,500 km² from latitudes 12 and So an estimated total population of 1,017,510 (Blue Nile State Food Security Technical Secretariat, 2014). The dominant livelihood in the state is agro-pastoralism, with the northern part of the state relying more on livestock and the southern more on agriculture (WFP, 2010). The livelihood in Blue Nile State is characterized by diversity. The State economic activity is based on agriculture, livestock, mining, and forest products. Villages are situated predominantly in areas in which soil is conducive to agriculture. Wild plants such as tubers, nuts, seeds, fruits and leaves make up the most important sources of food for the rural people (Balla et al., 2014).

The State has been heavily affected by civil war since 1987 (Bello et al., 2016). This ongoing civil war resulted in deterioration of infrastructure and social services, lack of government resources, and consequent instability and insecurity and forced about 115,000 and 165,000 people to flee their homes in the rural areas to live in and around the neighboring towns of Damazin and Rosaries, 550 kilometers south of the capital city of Khartoum. Another 50,000 people sought refuge in Ethiopia. Therefore, the civil war has resulted in drastic changes in quality of life, modes of livelihood in the State (Bello et al., 2016).

2.2. Sample selection and data collection

The present study was carried out to determine the community ecological knowledge and the household's trade of between coping strategy and natural resources management the South Kordofan and Blue Nile States of Sudan. It was conducted in 2015. The purposive sampling method was adopted to select 60 respondents households from each state, composed of three trade groups (10 households/group/site; n = 60); non-trading households, inexperienced trading households, and experienced trading households. The level of LEK held by respondents from each of the three trade groups was appraised. To do this, three products were selected from each site through prior investigation and *ad hoc* interviews and respondents' knowledge of these was

assessed. These were: (1) The product most commonly used for household consumption; trees used for charcoal and fuelwood in South Kordofan State and Blue Nile State, respectively; (2) The product most commonly traded; baobab fruits in South Kordofan State and charcoal in Blue Nile State; and (3) Honey was chosen as an ephemerally used product for the purpose of drawing out deeper levels of LEK due to the fact that not all people would have knowledge of these products. When a household was approached the most experienced trader was interviewed and in non-trading households the household head or *de jure* head. The analysis was of individuals as opposed to whole households and so caution was taken to avoid the influence of other household members during the course of the interview. In the context of shocks, households may experience, LEK held by an individual could be used to the advantage of the entire household, for example, knowledge of how to harvest a particular NR, process it and sell it in order to acquire cash to cope with a crisis.

2.3. Data analysis

The length and details of the answer provided by the respondent were used as an indicator for depth of analysis. Ballard and Huntsinger (2006) found that NR traders who had been involved in their occupation longer, had more knowledge and provided more detailed answers and explanations to questions. Western scientific knowledge was not used as a benchmark in this study in an attempt to move away from the notion of having to validate LEK with the scientific method (Agrawal, 1995). Instead, responses were scored relative to one another using the aforementioned indicator as a measure of knowledge. Five categories of knowledge level were constructed namely very high, high, medium, low, and no knowledge. Method 1 (Product analysis), involved an analysis of the full suite of responses given to the questions associated with each type of product, with more detailed responses reflecting greater understanding given the highest score and the remainder of the responses scored in relation to these. This provided an overall perspective of different trade groups' levels of LEK regarding each of the three different NR products.

The focus shifted in Method 2 (Respondent analysis) to evaluate all responses given by each individual respondent without any prior knowledge of the trade group they belonged to, their age, gender, or level of education, in order to avoid an unconscious bias. The answers to each product set of questions were ranked to scores and then disaggregated for each respondent to evaluate the individual's suite of responses in light of the scores assigned in Method 1. This procedure was carried out on two occasions several days apart to limit any inconsistencies in the authors' personal perceptions.

To gain a quantitative perspective of the analysis, in Method 3 (quantitative analysis), a numerical score was assigned to each of the five categories with no LEK being given 0%, low LEK 25%, medium 50%, high 75% and very high, 100%. Each of the responses provided by the respondent already ranked in Method 1 (no LEK - very high LEK), were then assigned a value according to the aforementioned system. This enabled calculation of an average score achieved by each respondent. The numerical scores assigned were classified as an intermediate knowledge weighting, hence a high knowledge weighting was incorporated such that high knowledge was valued at 100% and very high at 200%. Thereafter, a low knowledge weighting was valued at

35% as opposed to 25%; high knowledge was lowered to 62.5 % from 75% and very high knowledge was lowered to 70% from 100%.

The data was initially summarised in Microsoft Excel using descriptive statistics to describe the mean, mode, median and standard deviation. Following this, the statistical software, STATISTICA was used. Exploratory principle component analyses were run to investigate possible relationships between variables, following which the relevant significance tests were conducted. Pearson's Chi-Squared Test was used when dealing with categorical data. A p-value of less than 0.05 was accepted as being significant. Numerical data was analysed using a t-test for independent samples. One-way ANOVA was also utilised and the Fisher LSD post-hoc test where appropriate.

3. Results

3.1. Distribution of LEK and gender role

The study results revealed a strongly significant difference in the distribution of knowledge between inexperienced trading households in the two states ($\chi^2 = 27.5$; $p < 0.0001$) and, even more so, between experienced trading households ($\chi^2 = 106.0$; $p < 0.0001$), with South Kordofan traders displaying more knowledge in both respects (Table 1). In South Kordofan those involved in the trade were more knowledgeable than non-traders and among the traders; the experienced group was more knowledgeable than the inexperienced group. The differences were significant between non- and inexperienced trading households ($\chi^2 = 9.6$; $p < 0.05$) and between non- and experienced trading households ($\chi^2 = 29.2$; $p < 0.0001$). By contrast, there was not a significant difference in the distribution of knowledge among trade groups within the Blue Nile based on the results from the product analysis.

Table 2. A state comparison of the results from the product analysis

| LEK level | South Kordofan households | | | Blue Nile households | | |
|-----------|---------------------------|-----------------------|---------------------|----------------------|-----------------------|---------------------|
| | Non-trading | Inexperienced trading | Experienced trading | Non-trading | Inexperienced trading | Experienced trading |
| None | 18.0 | 10.9 | 6.7 | 23.8 | 20.3 | 25.5 |
| Low | 24.9 | 24.8 | 17.3 | 26.0 | 20.6 | 22.2 |
| Medium | 44.0 | 39.4 | 45.4 | 38.8 | 38.5 | 40.4 |
| High | 10.6 | 19.3 | 19.6 | 11.4 | 19.7 | 11.0 |
| Very high | 2.5 | 5.7 | 11.1 | 0.0 | 0.8 | 1.0 |

Looking at the distribution of knowledge surrounding trees there was a less significant difference between the two state samples ($\chi^2 = 17.2$; $p < 0.01$) but South Kordofan state experienced trading households were again more knowledgeable ($\chi^2 = 38.2$; $p < 0.0001$) than their equivalent in Blue Nile (Table 2). The

distribution of knowledge among the South Kordofan trade groups was less distinct in this regard, but a significant difference still occurred and to the greatest degree between inexperienced and experienced trading households ($\chi^2=15.3$; $p<0.01$). The same table also indicated that there was a significant distribution of knowledge across all three domains in the Blue Nile with respondents being most knowledgeable about baobab fruits (vs. trees, $\chi^2 = 28.1$; $p < 0.0001$; and vs. honey, $\chi^2=74.1$; $p<0.0001$). The distribution of knowledge around baobab fruits in South Kordofan followed the same trend of traders displaying greater knowledge than those not involved in the trade (non- vs. inexperienced, $\chi^2 =34.0$; $p<0.0001$; non- vs. experienced, $\chi^2 =18.0$; $p< 0.01$; and inexperienced vs. experienced traders, $\chi^2=18.2$; $p<0.01$). South Kordofanian were most knowledgeable about baobab in comparison to the other two domains (vs. honey, $\chi^2= 20.3$; $p<0.001$; and vs. trees, $\chi^2=91.7$; $p<0.0001$). In South Kordofan, trading households had more LEK than non-trading households in the honey domain and experienced trading households were most knowledgeable. Among the Blue Nile households there were no significant differences in the LEK displayed by the different groups although inexperienced trading households scored higher scores in the honey domains and experienced trading households in the tree domain (Table 2).

Table 2. Distribution of knowledge between South Kordofan and Blue Nile States households around the most commonly used NR (trees), an ephemeral product (honey) and the most commonly traded products in each state

| Product | LEK level | South Kordofan households | | | Product | Blue Nile households | | |
|---------|-----------|---------------------------|-----------------------|---------------------|---------|----------------------|-----------------------|---------------------|
| | | Non-trading | Inexperienced trading | Experienced trading | | Non-trading | Inexperienced trading | Experienced trading |
| Honey | None | 20.0 | 15.2 | 13.2 | | 42.4 | 40.5 | 51.3 |
| | Low | 30.0 | 18.2 | 17.0 | | 15.3 | 9.5 | 15.4 |
| | Med | 40.0 | 48.5 | 45.3 | | 32.2 | 31.0 | 24.4 |
| | High | 6.7 | 15.2 | 18.9 | | 10.2 | 16.7 | 9.0 |
| | Very high | 3.3 | 3.0 | 5.7 | | 0.0 | 2.4 | 0.0 |
| Trees | None | 10.0 | 7.3 | 6.8 | | 12.2 | 5.9 | 10.9 |
| | Low | 36.0 | 41.8 | 29.5 | | 42.9 | 35.3 | 34.4 |
| | Med | 42.0 | 30.9 | 40.9 | | 32.7 | 38.2 | 42.2 |
| | High | 10.0 | 18.2 | 13.6 | | 12.2 | 20.6 | 10.9 |
| | Very high | 2.0 | 1.8 | 9.1 | | 0.0 | 0.0 | 1.6 |
| Baobab | None | 23.9 | 10.2 | 0.0 | | 16.7 | 14.6 | 14.3 |
| | Low | 8.7 | 14.3 | 5.3 | | 20.0 | 17.1 | 16.9 |
| | Med | 50.0 | 38.8 | 50.0 | | 51.7 | 46.3 | 54.5 |
| | High | 15.2 | 24.5 | 26.3 | | 11.7 | 22.0 | 13.0 |
| | Very high | 2.2 | 12.2 | 18.4 | | 0.0 | 0.0 | 1.3 |

An analysis of the number of years spent in the trade and LEK level showed that a significant difference occurred, both in the two states. In South Kordofan the significance lay with those exhibiting very high levels of LEK who were involved in the trade for longer (25.7±19.3 years; $F = 5.3$; $p < 0.01$) (Table 3). In the Blue Nile, a different trend was found with more inexperienced traders showing greater levels of knowledge than experienced (low LEK: 10.3±9.8 years vs. medium LEK: 25.4±14.0 years vs. high LEK 5.3±6.6 years; $F=5.6$; $p < 0.05$) (Table 3). An investigation into the reason behind this trend in the Blue Nile exposed a significant relationship between gender and LEK in the country with male respondents displaying more knowledge of the three products than females (43.8±7.1 vs. 29.4±8.8; $t=4.8$; $p < 0.0001$) (Table 3). The same table revealed that there was a significant difference in LEK levels between males and females in South Kordofan ($\chi^2 = 10.0$; $p < 0.01$ vs. $\chi^2 = 48.0$; $p < 0.0001$).

Table 3. LEK among trader groups and gender differentiation in Blue Nile and South Kordofan (% scores for each product)

| Country | Product | Non-trading | | Inexperienced trader | | Experienced trader | |
|----------------|--------------------|-------------|--------|----------------------|--------|--------------------|--------|
| | | Male | Female | Male | Female | Male | Female |
| Blue Nile | Honey | 36.0 | 15.5 | 52.8 | 17.7 | 37.3 | 16.7 |
| | Trees ¹ | 40.8 | 28.8 | 53.3 | 35.0 | 42.5 | 38.3 |
| | Gums | 44.4 | 27.9 | 54.2 | 34.7 | 45.1 | 40.5 |
| South Kordofan | Honey | 47.2 | 30.9 | 44.9 | 35.4 | 52.1 | 36.1 |
| | Trees ¹ | 40.0 | 39.3 | 41.1 | 42.5 | 49.2 | 41.7 |
| | Baobab | 51.7 | 36.3 | 56.4 | 40.0 | 67.7 | 58.3 |

¹In Blue Nile state, trees pertain to charcoal, while in South Kordofan state they pertain to firewood

3.2. Coping strategies used with different level of LEK

The differences in the distribution of strategies for non-AIDS proxy and AIDS proxy shock categories among the Blue Nile and South Kordofan households was remarkably significant ($\chi^2 = 335.9$; $p < 0.0001$ and $\chi^2 = 101.6$; $p < 0.0001$, respectively). Blue Nile households relied a great deal on agricultural adjustments (42.2% of strategies) for non-AIDS proxy shocks and used kinship, savings, and the NR trade [used twice as often for these shocks; ($\chi^2 = 5.7$; $p < 0.05$)], and to a lesser extent, the consumption of NRs significantly more when dealing with AIDS proxy shocks. Conversely, there was not a significant difference in the degree to which NRs were utilised by South Kordofan households for the two shock categories although the consumption thereof was the primary strategy employed (20.7% of strategies) when faced with non-AIDS proxy shocks. The trade of NRs made was the second most frequently (13.8%) employed strategy in this case. When confronting AIDS proxy shocks, kinship was their primary strategy (24.3%) and together with savings and cash loans, were used significantly more for this group of shocks.

Across the two sites, there was a significant difference in the distribution of coping strategies employed by those with low levels of LEK to those with high to very high levels ($\chi^2=64.0$; $p<0.0001$) (Table 4). The same table indicated that there was a significant difference in the distribution of coping strategies across LEK levels in both the Blue Nile and South Kordofan independently ($\chi^2=107.0$; $p<0.0001$; $\chi^2=31.9$; $p<0.001$, respectively). In South Kordofan no respondents were ranked as having very high LEK. The two most common responses given there by high LEK respondents in reply to shock were to either make use of savings or to offer no strategy at all. By comparison, well-informed Blue Nile households also utilised savings more regularly than their less well-informed counterparts. For those with low levels of LEK, kinship and piece work were coping strategies employed more frequently, but more often than not they were unable to offer a response to shock. With regards to the use of NRs as a coping strategy, the only significant difference that occurred between households with low and high to very high levels of LEK was in the Blue Nile with the more knowledgeable households adopting this strategy.

4. Discussion

Generally speaking, trading households displayed more advanced levels of LEK across the two states. This was explained by the significant relationship found between gender and LEK, and the distribution of male and female respondents in each of the three trade groups in each state. Male respondents had higher LEK levels than females in every trade group and for every product. Furthermore, the largest proportion of females from the South Kordofan sample was located in experienced trading households. The highest scores obtained by South Kordofan females were those from experienced trading households and their LEK of honey. In the Blue Nile, the male respondents also displayed greater levels of LEK than the females across all three trade groups and two of the three products, where female respondents from inexperienced trading households displayed slightly higher levels of LEK. It is generally understood that females frequently have greater levels of LEK than males because they harvest and process a much wider range of NRs than men (Shackleton and Shackleton, 2006). This result is not in line with Souto and Ticktin (2012) who indicated that men were significantly more knowledgeable than women. It is understood that the collectors and users of wood and wood-based products are almost entirely male apart from for kindling, twig yard brushes and fuelwood collected for household consumption (Lado, 2004; Shackleton and Shackleton, 2006; Gouwakinnou et al., 2011). The harvesting of honey is purported to fall in the domain of men and boys (Shackleton and Shackleton, 2004; Singh et al., 2010). The baobab fruit trade in South Kordofan was a livelihood which involved both males and females although of the 25 traders encountered, 72% were female. Despite this, male traders from this region had more knowledge than females about this product. The most marked difference in LEK levels between male and female respondents from South Kordofan and the Blue Nile was in connection with honey; a finding which corresponds with the aforementioned classification of gender roles with regards to NR use (Shackleton and Shackleton, 2004). The same applies to Blue Nile males' greater knowledge around honey.

With regards to LEK pertaining to trees, the distinction was less clear, particularly in Blue Nile where there was very little difference in LEK levels between male and female respondents in this regard. Women are thought to know more uses for individual species, especially trees. Several studies have shown that females have more knowledge of medicinal plant species and more detailed knowledge of their use than men (Lado, 2004; Pilgrim et al., 2007; Quinlan and Quinlan, 2007; Houehanou et al., 2011). Studies in Indonesia and the Amazon revealed that women were persistently more knowledgeable about herbaceous and non-forest plants than men, though in Tanzania men knew more tree species and their uses although this was only significant for charcoal and other wood-based trades (Luoga et al., 2000). In the Blue Nile, wood and wood-based products were the most frequently recorded products being traded during the survey yet there was noteworthy female involvement in this activity. This result is similar to the one observed by Camou-Guerrero et al. (2008) who pointed out that men had more knowledge on construction and domestic goods.

The significant difference in the kinds of coping strategies employed by those with low levels of LEK to those with high to very high levels across the two states, thus lends some insight into the influence levels of LEK may have on household vulnerability. Those with low LEK levels from the Blue Nile relied more heavily on kinship and piecework, while those from South Kordofan were forced to alter the household diet. Kerr (2005) and of Kamanga et al. (2009) found that the poorest households who were relying on *ganyu labour* (piece work) as a source of food and income with a third of their income coming from this activity. Kerr (2005) also states that seasonal *ganyu* is a measure of vulnerability as opposed to a form of social capital as other authors have implied. By comparison, those with high to very high levels of LEK in the Blue Nile and South Kordofan relied primarily on savings that they had accrued to endure times of hardship implying an improved state of wellbeing in contrast to households with low levels of LEK, presumably brought about by the more secure cash incomes from the trade in NRs. As far as the use of NRs (trade and consumption) as a coping strategy was concerned, the result was different in each state. In South Kordofan there was no significant difference between household LEK levels and adoption of this strategy. Although the NRs strategy made up a comparatively higher proportion of the total strategies employed in South Kordofan than it did in the Blue Nile. By contrast, a significant difference was found between household LEK levels and the use of the NR strategy in Blue Nile where more knowledgeable households utilised this strategy to a greater extent (more specifically the trade). Bear in mind, through all methods, trading households from this site exhibited greater levels of knowledge than non-trading households and, furthermore, it was the non-trading households who were more frequently in a position where they could not offer a coping strategy in response to shock. LEK could, therefore, be a strong contributing factor for a household's ability to withstand shocks. The manifestation of this is that households with greater levels of LEK therefore have more options in terms of coping strategies they could employ, including the consumption of and trade in NRs.

Table 4: Coping strategies employed by respondents with different levels of LEK across two study areas

| Coping Strategy | Blue Nile Total | Blue Nile | | South Kordofan Total | South Kordofan | | Pooled Total | Pooled LEK Level (%) | |
|--------------------------|--------------------|---------------|------------------|----------------------------|----------------|--------------|-----------------|----------------------|---------------------|
| | | LEK Level (%) | | | LEK Level (%) | | | Low | High - very high |
| | | Low | High - very high | | Low | High | | Low | High - very high |
| Agricultural adjustments | 9 | 16.7 | 15.0 | 0 | 0.0 | 0.0 | 9 | 6.8 | 11.1 |
| Cash loan | 1 | 5.6 | 0.0 | 1 | 3.8 | 0.0 | 2 | 4.5 | 0.0 |
| Changed diet | 1 | 0.0 | 2.5 | 3 | 11.5 | 0.0 | 4 | 6.8 | 1.9 |
| Cut down expenses | 4 | 5.6 | 7.5 | 4 | 11.5 | 7.1 | 8 | 9.1 | 7.4 |
| Kinship | 3 | 11.1 | 2.5 | 7 | 19.2 | 14.3 | 10 | 15.9 | 5.6 |
| Nothing | 8 | 22.2 | 10.0 | 7 | 15.4 | 21.4 | 15 | 18.2 | 13.0 |
| NR sale | 5 | 5.6 | 10.0 | 3 | 7.7 | 7.1 | 8 | 6.8 | 9.3 |
| NR use | 1 | 0.0 | 2.5 | 6 | 15.4 | 14.3 | 7 | 9.1 | 5.6 |
| Other | 8 | 5.6 | 17.5 | 4 | 11.5 | 7.1 | 12 | 9.1 | 14.8 |
| Petty trade | 2 | 0.0 | 5.0 | 0 | 0.0 | 0.0 | 2 | 0.0 | 3.7 |
| Piece work | 5 | 16.7 | 5.0 | 2 | 3.8 | 7.1 | 7 | 9.1 | 5.6 |
| Savings | 8 | 5.6 | 17.5 | 3 | 0.0 | 21.4 | 11 | 2.3 | 18.5 |
| Sold assets | 2 | 5.6 | 2.5 | 0 | 0.0 | 0.0 | 2 | 2.3 | 1.9 |
| Sold livestock | 1 | 0.0 | 2.5 | 0 | 0.0 | 0.0 | 1 | 0.0 | 1.9 |
| Total | 58 | 100.0 | 100.0 | 40 | 100.0 | 100.0 | 98 | 100.0 | 100.0 |

5. Conclusion

Across the two study states, trading households emerged as having superior levels of LEK in comparison to non-trading households. However, at first glance, it is not clear whether it was this knowledge that contributed towards these households' decision to engage in the trade or whether, due to their involvement, their levels of LEK have subsequently increased. Yet, a look at the distribution of knowledge between the Blue Nile and South Kordofan households around the three products lends some insight into this debate. As far as the most commonly traded products in each of the two states are concerned, the trading households, as may have been expected, emerged as having greater LEK. It was, however, baobab fruit, honey that provided the clearest contrast between trading and non-trading households. Therefore, although this particular product was seldom traded in each of the states, it was the trading households that had more knowledge of it. This suggests that a household's level of LEK may have been a contributing factor in their choice of livelihood and coping strategy when facing trials, as opposed to the other way around. The LEK appraisal also drew attention to the role gender and age play in LEK pertaining to different products and offers some insights into the importance of certain user groups. Furthermore, differences in knowledge of resource selection and use, based on gender and age, can inform and sharpen conservation prioritization, planning and monitoring (Dovie et al., 2008).

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