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Determinants of shea nut marketing arrangements in northern Uganda

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Abstract
This study assessed factors influencing shea nut actors' choices of shea nut marketing arrangements in northern Uganda. An understanding of these factors is vital in influencing the choice of the different marketing arrangements. Cross-sectional data was collected from a sample of 325 shea nut actors. Data was analysed using descriptive statistics and multinomial logit model. The shea nut actors in this study were composed of 78% collectors, 16% traders and 7% processors. About 73% and 43% of shea collectors and traders, respectively, sold their shea nuts and/or products through spot markets, while, 45% of the processors sold their shea nut and/or products through informal contracts. Formal contract was the least common marketing arrangement among all the actors. The probability of choosing each the marketing arrangement were influenced by several factors including experience, education, income level, access to extension, training, access to credit, awareness of innovations in the shea value chain, awareness of value addition supporting institutions, main occupation (farming), distance to the market, access to information and means of transport used (head portage). Efforts to increase formal contract participation should focus on providing extensions and creating awareness about institutions that support value addition. There is need for a location and actor specific approach in promoting the different market arrangements in shea products marketing.

Keywords Informal contracts · Formal contracts · Shea nut · Shea nut actors · Uganda

1 Introduction

Shea tree (*Vitellaria paradoxa*) is an economically important tree with multiple purposes including nutritional, cosmetic and pharmaceutical uses [1–5]. The tree and its products support livelihood of millions of actors in its value chain [6, 7]. Due to health and nutritional benefits associated with the tree, it is becoming an important foreign exchange commodity [7, 8]. It is also considered a pro-poor commodity that has the potential of uplifting the livelihoods of millions including women [4, 9] dominating the bottom of the value chain as shea nut collectors [10].

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The shea value chain in Uganda consists of collectors, traders and processors who are mostly found in the shea belt of the country. The collectors form the base of the chain, participating in collecting the seasons' shea nuts produced from the shea tree. After collecting, they either sell the nuts in its raw form to processors and/or traders, or add some value before selling [10]. Given the associated benefits, shea and its products are marketed domestically and internationally [11–13] in liberalized markets. Despite their participation in local and international markets, the local small-scale actors including collectors, traders and processors are usually less competitive in the global shea value chain [14, 15]. This low competitiveness relative to larger national and international actors, implies that the majority of collectors, local traders as well as processors do not earn what they would have earned if they were competitive enough [7, 8]. This lack of competitiveness implies that the shea actors at the bottom of the chain do not earn the incomes they should be earning thereby threatening the potential of Shea for poverty alleviation [7, 16]. In a typical shea value chain, this competitiveness is largely associated with the size of the actor. At the bottom of the chain, the shea collectors are the most uncompetitive as shown by individual share of the volume handled [17].

The low competitiveness of the local shea actors is partly attributed to reliance on marketing arrangements that do not pay the price premiums. In agribusiness, marketing arrangement which are sometimes called institutional arrangements refer to how the actors relate to each other through either formal or informal arrangements [18, 19]. In the shea value chain, common marketing arrangements include: spot marketing which refers to sale of products to any random buyer in the market; contracts which can either be written (formal) or verbal (un-written/informal) between two actors; and a hybrid of the different marketing arrangements including collective marketing [18, 20, 21]. According to Akatwetaba et al. [10], over 60% of shea collectors in northern Uganda, sold their shea products through spot markets.

The type of marketing arrangement chosen by a given actor influences their business performance including profits and sustainability required for long term performance [22, 23]. In other words, each of the marketing arrangements provide some benefits and disbenefits for the actors. For instance, studies have shown that whereas farmers usually earn less profits when transacting through formal contracts [24, 25], they are vital in improving input access for producers [26], as well as providing sustained market access across seasons [23, 27]. Similarly, whereas collective marketing which is also referred to as group marketing has been associated with reduced transaction cost, improved bargaining power and higher revenues for participants [20, 28, 29], there efficiency and effectiveness requires addressing the challenges associated with group participation [30]. Additionally, collective marketing has also been shown to improve incomes of small value chain actors in addition to providing other benefits such as better access to support services [7, 31, 32]. Both contract and collective or group marketing are associated with relatively larger volumes of produce handled as well as lower transaction cost. As opposed to contracts and collective marketing, spot marketing are usually associated with significantly lower volumes of produce handled, high transactions cost and overall lower revenue and profits for small value chain actors including producers and collectors of non-timber agro-forest product [33–35].

Based on the discussion above, it can be said that each of the existing marketing arrangements present shea actors with some incentive as well as disincentives. This is why actors choose one arrangement over the other. In essence, preference for the different marketing arrangement is largely determined by the existing attributes of the arrangements [36]. The choice of which market arrangement to undertake thus follows the utility maximization theory (UMT) which postulates that, an actor would choose that course of action for which the expected and/or perceived utility is highest [37]. In reality this choice is usually subject to a set of constraints [38]. In the shea value chain, these constraints relate to social, economic and institutional factors [10]. Whereas shea actors would choose from among the different marketing arrangements, the perceived benefits cannot be measured directly, but is a function of these constraints that vary depending on the circumstance. Consequently, despite the benefits associated with each of the existing marketing arrangements, an understanding of what drives actor's choice of one marketing arrangement over the other is paramount in developing strategies to improve shea actor's competitiveness. Choosing the most appropriate marketing arrangement is vital in fostering the competitiveness of the shea actors. This is especially true due to the current globalisation of the shea value chain [8, 31]. The choice of a given marketing arrangement is driven by several factors which usually vary across locations and products [33–35] and is expected to vary across actors [39]. In the shea value chain of northern Uganda, information on such factors that drive the choice among the different marketing arrangements is empirically lacking. Studies on the shea value chain in northern Uganda have focused on value addition and marketing channels [10, 40, 41], but not on marketing arrangements. To augment these studies, a study on shea marketing arrangement with focus on factors influencing choice of marketing arrangement would provide evidence required for encouraging shea actors to take up those marketing arrangements that would maximize their returns. The purpose of this study was therefore to fill this knowledge void, by assessing the factors associated with choice of the different marketing arrangements in the marketing of shea and shea products in northern Uganda.

2 Methodology

2.1 Study area

This study was conducted in the shea belt of northern Uganda. Specifically, the districts of Otuke, Lira and Pader (See Akatwetaba et al. [10], for map of study area) were selected due to the high concentration of shea trees [42]. Otuke district covers a total area of 1,550 km^2 and is located on geographical coordinates of 02°30′ north, and 33°30′ east. On the other hand, Lira District covers a total area of 1,549.8 km^2 and is located on geographical coordinates of 02°14′50″ north, and 32°54′00″ east. Pader district cover a total area of 3,362.5 km^2 and is located on geographical coordinate 02°50′ north and 33°05′east. Lira and Otuke districts are located in the eastern part of Lango sub-region, while Pader is located in the eastern part of Acholi sub-region. All the three districts border each other, but are also surrounded by several other districts [10]. The main economic activity in these districts is crop and livestock farming, with majority of inhabitants involved in gathering of shea nuts usually found growing natural in their gardens.

2.2 Data collection and sampling technique

This study used cross-sectional primary data that was collected from a sample of shea value chain actors in the study area. The sample size for the study was determined using the formula proposed by Cockran [43] for determining sample size of for an unknown population. Given that in the shea value chain, the shea collectors dominate and thus it is easier to identify collectors as opposed to the other shea actors, the study determined the number of shea collectors to be included in the study using the Cockran formula. The formula is specified in Eq. (1).

$$n = \frac{Z^2 p(1-p)}{e^2} \tag{1}$$

where: n is the required sample size, Z is the test statistic at a level of significance. The study used Z at 95% which is 1.96. p is estimated proportion of shea collectors in the study area. The study assumed that the proportion of shea collectors in the study area was 78%. e is the level of precision assumed to be 5%. The number of shea collectors to be included in the study was thus 264. The selection of these collectors followed a multi-stage approach, starting with the sub-counties with the highest concentration of shea trees. In each district, two sub-counties were thus selected. In each sub-county, the study selected using quota sampling 44 shea collectors. However, due to non-completeness of information, observations from twelve respondents were drop. The number of shea collectors included in the final study thus dropped to 252. The selection of shea traders and processors followed a respondent driven sampling [44] approach in that each shea collector was asked at the end of the interview to provide details of shea traders and processors there were aware of. Using this approach, the researchers were able to survey 51 shea traders and 22 shea processors, all identified from the study districts. The total sample for the study was thus 325 shea actors.

The primary cross-sectional data was collected using structured researcher administered questionnaire. The questionnaire was developed for purposes of the study and contained information on socio-demographic and economic characteristics as well as shea actor's marketing variables. Prior to data collection, the questionnaire was pre-tested in Gulu district, which neighbours Pader district. The pre-test was used to evaluate the content validity as well as reliability of the tool, by assessing the completeness, accuracy and clarity of the questions in the questionnaire with respect to study objectives. After the pre-test, the necessary amendments and improvements were made. Specifically, the amendments and improvements involved rephrasing questions that were not clear, ensuing all responses are mutually exclusive as well as revising the whole questionnaire to ensure easy readability, common interpretation and common understanding by everyone involved. Both the pre-test and actual field data collection were conducted by a team of competent enumerators who were trained on the tool prior to the start of the whole field work. Data was collected using hard copy questionnaires, and was entered into Microsoft Excel for further processing and analysis.

2.3 Data analysis

Collected data was clean prior to data analysis. Data was analysed using STATA v15 statistical package. Data analysis involved both descriptive and econometric methods. The descriptive analysis was used to present the summary

statistics of the variables in the study. Cross tabulations with test for significance were also performed for specific categorical variables (i.e. marketing arrangements, actor type and district). An econometric approach was used to assess the factors associated with choice of each of the marketing arrangements used by shea actors in shea marketing. The marketing arrangement variable which formed the dependent variable for the econometric analysis is choice variable in that a shea actor can choose one option over the other. This means that the ordinary least squares (OLS) regression was inappropriate for such analysis [45]. The study focused on spot marketing (Sale through spot markets included sale by individual actors or group of actors through the spot market. This was so given both spot marketing and sale through the group failed the IAA assumption. The two categories were this identical and thus treated as one.), informal contracts and formal contracts as the marketing arrangements used by shea actors in the study area. Given that there were more than two marketing arrangements being investigated, the binary regression models (probit and logit), were also inappropriate. Similarly, marketing arrangement is a nominal variable and the categories do not have any natural order of numbering, thus, the ordered multinomial models were also inappropriate for the econometric analysis [46]. The study therefore opted for the multinomial model. Specifically, the multinomial logistic regression model was used due to its robustness. Kropko [47] observed that the multinomial logit usually nearly provides more accurate results than the multinomial probit model. Empirically, a shea value chain actor's choice of marketing arrangement can be analysed following Eq. (2).

$$y_i = \alpha + X'_{ij}B_j + \varepsilon_{ij} \tag{2}$$

where: y_i is the categorical dependent variable representing the different marketing arrangements from which a shea actor can choose an alternative from. In this study, three different marketing arrangements including spot markets, informal contracts, and formal contracts were identified. The option of spot markets includes both individuals selling through spot markets as well as groups selling through spot markets. Following Meraner and Finger [48], y_i can be presented as in Eq. (3).

$$y_i(\textit{marketing arrangement}) = \begin{cases} 1 \textit{ if } y_i^* = \textit{Spot marketing} \\ 2 \textit{ if } y_i^* = \textit{Informal Contral} \\ 3 \textit{ if } y_i^* = \textit{Formal Contral} \end{cases} \tag{3}$$

where: X'_{ij} represents a vector of explanatory variables including both shea actor's characteristics and institutional factors that can potentially influence choice of the different marketing arrangements. Table 1 presents the description of these explanatory variables together with their *apriori* expectations. While estimating the model, spot marketing was treated as the base outcome and consequently, the *apriori* expectations have been presented for the other options in relation to spot marketing.

In practice, the marketing arrangement used in shea marketing are without any obvious ordering. This is because, whereas the several options lead to different outcomes, depending on the circumstances at play, each of them can actually lead to the best outcome for the actor. Consequently, a shea actor selects a single alternative marketing arrangement (j) from a number of alternatives based on the expected utility level (U_{ij}) as specified in Eq. (4).

$$U_{ij} = X'_{ij}\beta_j + \varepsilon_{ij} \tag{4}$$

In this case, ε_{ij} is the unobserved error term with the normal distribution assumption across shea actors and available alternatives. In essence, a shea actor only chooses an alternative marketing arrangement if it has the highest utility [37]. The parameters of the multinomial logistic model were estimated using the method of maximum likelihood. Since the coefficient of the multinomial logit do not depict changes in the probability of choosing an alternative j attributed to changes in the explanatory variable, the marginal effects following each alternative were estimated following specification in Eq. (5). Each β_j represents the effect of a given explanatory variable on the probability of choosing the respective alternative j to m.

$$\frac{\partial P_{ij}}{\partial X_i} = P_{ij} - \sum_{m=1}^{j-1} P_{im}\beta_{mk}; j = 1, \ldots .., j-1 \tag{5}$$

Table 1 Description of variables used in the model and their *apriori* expectation

Variable	Measurement/description of variable	*Apriori* expectation in relation to spot marketing	
		Informal contracts	Formal contracts
Dependent variable			
Marketing arrangement	Categorical variable for market arrangement from which farmers can choose from (1 = spot marketing, 2 = informal contracts, 3 = formal contracts)		
Explanatory variables			
Male	Male gender dummy (1 = male, 0 = female)	±	±
Experience	Shea actor's experience in years	−	+
Education	Shea actor's level of education in years of formal schooling	−	+
Processing income	Income from shea trade and processing in Uganda Shillings (UGX) (United States Dollar (USD) 1 was equivalent to UGX 3650 at the time of data collection)	−	+
Non-processing income	Income from non-shea processing in UGX	+	−
Extension	Access to extension services (1 = yes, 0 = no)	−	+
Receive trainings	Actor received training on shea processing (1 = yes, 0 = no)	−	+
Receive information	Actor received shea market information (1 = yes, 0 = no). Focus was on receiving information on product price	+	−
Means of transport	Main mode of transport (1 = head portage, 0 = motorized means)	−	+
Aware of institutions	Shea actor is aware of the presence of those institutions that support shea processing (1 = yes, 0 = no)	−	+
Credit	Access to credit (1 = yes, 0 = no)	−	+
Practice value addition	Shea actor changes form of the product (1 = yes, 0 = no)	−	+
Farmer	Farming is the main occupation of shea actor (1 = yes, 0 = no)	−	+
Collector	Shea actor is collector (1 = yes, 0 = no)	+	−
Processor	Shea actor is processor (1 = yes, 0 = no)	−	+
Trader	Shea actor is trader (1 = yes, 0 = no)	−	+
Otuke	District of shea actor is Otuke (1 = yes, 0 = no)	±	±
Lira	District of shea actor is Lira (1 = yes, 0 = no)	±	±
Pader	District of shea actor is Pader (1 = yes, 0 = no)	±	±
Distance to market point	Distance to the nearest shea marketing point	+	±

Prior to the estimation of the multinomial logistic regression model, a pair wise correlation of explanatory variables with the aim of removing any variable with very high correlation was performed. This was necessary so as not to include variables which are collinear. All the correlation coefficients for the final explanatory variables in the model were less 0.6 (Supplementary file). According to Dormann et al. [49], correlation coefficient less than 0.7 are usually not associated with the problem of multicollinearity. This was confirmed by the variance inflationary factor (VIF) test which showed that the maximum VIF values from this model was 1.98, while the mean was 1.47, indicating no problem of multicollinearity. To control for any potential heteroskedasticity, the robust option of STATA was used to estimate robust standard errors. After estimating the model, model fit diagnostics showed good model fit, while, the tests of Independence of Irrelevant Alternatives (IIA) assumption showed that in the final model, this assumption was not violated (Supplementary file). Both the model fit diagnostics and the IIA assumption test followed the procedures presented by Long & Freese [50].

3 Results

3.1 Socio-demographic and economic characteristics

This study found that women constituted the biggest proportion of shea nut actors (59%) while males constituted only 41% of the actors, with an average of six years of formal education. On average, the shea nut actors had an experience of 10 years, and were staying approximately about 5.7 kms away from the shea nut marketing points. The average income generated from processed shea nut products was found to be higher (UGX 310,667) compared to that got from non-processed shea nut (UGX 274,038). Only 14% of the respondents had access to extension services, while, 23% received training, 14% received information, 11% were aware of institutions that supported shea nut processing, 8% had access to credit, and 61% of the respondents practiced shea value addition. About 49% used head portage as their main mode of transporting shea and/or its products to the market. Most (89%) of the shea actors had farming as their main occupation. There were 78% shea collectors, 16% were shea traders, and 7% shea processors. Thirty four percent of the actors were from Otuke district, 33% from Pader district and another 33% from Lira district (Table 2).

3.2 Marketing arrangements for shea nuts and/or products

From the study, results show that at least 65% of the respondents used spot marketing in the marketing shea nut and its products, while, 23% used informal contracts and 12% used formal contracts (Table 3). The chi-square test of association reveals that there was a significant association between marketing arrangement and shea nut value chain actor type. Specifically, the use of spot marketing in shea marketing was most common (73%) among shea collectors and least common (36%) among shea processors. Similarly, the use informal contracts in shea marketing was most common (45%) among shea processors and least common among shea collectors (17%). The use of formal contracts in shea marketing was highest (18%) among processors and lowest (10%) among collectors.

Similarly, the chi-square test of association also revealed that there was a significant association between marketing arrangement and district of the shea value chain actor (Table 4). Specifically, the use of spot marketing in shea marketing was most common (86%) among actors in Pader district and least common (55%) among shea actors in Lira district. Conversely, the use informal contracts in shea marketing was most common (33%) among shea actors in Lira district but least common (10%) among shea actors in Pader district. The use of formal contracts in shea marketing was highest (19%) among shea actors in Otuke district but least common (4%) among shea actors in Pader district.

3.3 Factors influencing choice of shea nut marketing arrangement

The results for the multinomial logistic regression model for factors driving the choice of the different marketing arrangements are presented in Table 5 and Appendix Table A1. Results show that choice of informal contracts in shea marketing had significant association with shea actor's experience, both shea processing and non-shea processing income, receiving training, practicing value addition, main occupation of actor, actor type, location of the farmer and distance to the market. Similarly, the choice of formal contracts in the marketing of shea had significant association with actor's level of education, income from shea processing, access to extension services, receiving information, means of transport, awareness of institution supporting shea, access to credit, practicing value addition and location of actor (Appendix Table A1).

Table 2 Summary statistics for demographic characteristics

Variable	Mean	Std. Dev
Male	0.41	0.49
Experience	10.26	8.49
Education	6.24	2.64
Processing income	310,667.70	448,934.80
Non-processing income	274,038.50	479,789.80
Extension	0.14	0.35
Receive trainings	0.23	0.42
Receive information	0.14	0.35
Means of transport	0.49	0.50
Aware of institutions	0.11	0.31
Credit	0.08	0.27
Practice value addition	0.61	0.49
Farmer	0.89	0.32
Collector	0.78	0.42
Processor	0.07	0.25
Trader	0.16	0.36
Otuke	0.34	0.47
Lira	0.33	0.47
Pader	0.33	0.47
Distance to market	5.69	8.77

In the case of dummies, the mean values represent and proportion attributed the category coded as 1: These were multiplied by 100 are reported as percentages

Table 3 Comparing marketing arrangements by player type

Market arrangement	Percent (%)			
	Overall (n = 325)	Collectors (n = 252)	Trader (n = 51)	Processor (n = 22)
Spot markets	65.54	72.62	43.14	36.36
Informal contract	22.77	17.06	41.18	45.45
Formal contract	11.69	10.32	15.69	18.18

Pearson Chi^2 (4) = 26.7502; *p*-value = 0.000

Table 4 Comparing marketing arrangement by district

Market arrangement	Percent (%)			
	Overall (n = 325)	Otuke (n = 109)	Lira (n = 108)	Pader (n = 108)
Spot	65.54	55.96	54.63	86.11
Informal contract	22.77	24.77	33.33	10.19
Formal contract	11.69	19.27	12.04	3.70

Pearson Chi^2 (4) = 34.7100 *p*-value = 0.000

Following the multinomial logistic regression model, the study estimated the marginal effects so as to understand the changes in the probability of choosing each marketing arrangement with respect to changes in each of the explanatory variables. The marginal effects results presented in Table 5 shows that actor's experience in the shea value chain had a negative and significant influence on the decision to choose spot marketing, but a significant positive influence on the decision to choose informal contracts. The findings suggest that, an increase in shea actor's experience in years reduced the probability of selling shea through spot markets by 1.5%, but increased the probability of selling shea through informal contracts by 1.4%. Results on actors' level of education shows that actor's level of education had significant positively influence on decision to sell shea through formal contracts. This suggests that, an increased in actor's level

Table 5 Marginal Effects of factors influencing choice of shea nut marketing arrangement

Variable	Marginal effects (SE)		
	Spot marketing	Informal contract	Formal contract
Gender (Male)	0.002 (0.047)	0.001 (0.042)	−0.004 (0.015)
Experience	−0.015 (0.003)***	0.014 (0.003)***	0.001 (0.001)
Education	0.005 (0.010)	−0.012 (0.008)	0.007 (0.004)*
Log processing income	−0.080 (0.037)**	0.063 (0.037)*	0.018 (0.011)
Log non-processing income	0.021 (0.022)	−0.040 (0.020)**	0.019 (0.009)**
Extension	−0.293 (0.161)*	−0.030 (0.067)	0.323 (0.144)**
Received training	−0.311 (0.105)***	0.329 (0.107)***	−0.018 (0.019)
Received information	−0.025 (0.111)	0.067 (0.109)	−0.042 (0.018)**
Means of transport	0.113 (0.058)*	−0.028 (0.050)	−0.086 (0.029)***
Aware of institutions	−0.071 (0.086)	−0.094 (0.036)**	0.166 (0.079)**
Credit	0.101 (0.084)	−0.058 (0.082)	−0.042 (0.016)***
Practice value addition	−0.125 (0.054)**	0.086 (0.048)*	0.039 (0.023)*
Farmers	−0.123 (0.041)***	0.110 (0.036)***	0.013 (0.016)
Collectors	0.393 (0.121)***	−0.367 (0.121)***	−0.026 (0.036)
Lira	−0.088 (0.070)	0.081 (0.067)	0.007 (0.020)
Pader	0.339 (0.054)***	−0.278 (0.052)***	−0.061 (0.032)*
Distance to market point	−0.010 (0.002)***	0.008 (0.002)***	0.002 (0.001)

SE Standard error in parentheses; *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

of education increased the probability of selling shea through formal contracts by 0.7%. Results on income from shea processing shows that income from shea processing significantly negatively influenced actor's decision to choose spot markets, but significantly positively influenced their decision choose informal contracts. This finding suggests that, a percentage increase in shea processing income reduced the probability of selling shea through spot markets by 8%, but increased the probability of selling shea through informal contracts by 6.3%. On the other hand, results on non-shea processing income shows that non shea processing income significantly negatively influenced the decision to choose informal contracts. The findings suggest that, a percentage increase in income from non-shea processing reduced the probability of selling shea through informal contracts by 4%, but increased the probability of selling shea through formal contracts by 1.9%.

Results also shows that receiving extension visits had a significant negative influence on the decision to choose spot marketing, but a significant positive influence on the decision choose formal contracts (Table 5). The findings suggest that, receiving extension visits decreased the probability of selling shea through spot markets by 29%, but increased the probability of selling shea through formal contracts by 32%. With respect receiving training on shea value addition, results show that receiving training significantly negatively influence the decision to choose spot marketing, but significantly positively influenced the decision to choose informal contracts. Specifically, the findings suggest that, receiving training decreased the probability of selling through spot markets by 31%, but increased the probability of selling shea through informal contracts by 33%.

The findings on receiving information on shea marketing and price shows that receiving such information had a significant negative influence on the decision to choose formal contracts (Table 5). Specifically, receiving market and price information reduced the probability of selling shea through formal contracts by 4.2%. Results also show that use of head pottage as a means of transport significantly positively influenced the decision to choose spot markets and significantly negatively influenced the decision to choose formal contracts. Specifically, use of head pottage as a means of transport increased the probability of selling shea through spot markets by 11.3%, but decreased the probability of selling shea through formal contracts by 8.6%. On the other hand, awareness of institutions that support shea value addition significantly negatively influenced decision to choose informal contracts, but significantly positively influenced the decision to choose formal contracts. Specifically, being aware of institutions supporting shea processing reduced the probability of selling shea through informal contracts by 9.4%, but increased the probability to sell shea through formal contracts by 16.6%. Access to credit had a negative and significant influence on actor's decision to choose formal contracts. The findings suggest that, accessing credit reduced the probability of selling shea through formal contracts by 4.2%.

Results from this study also show that practicing value addition had a significant negative influence on actor's decision to choose spot markets, but a significant positive influence on actor's decision to choose informal and formal contracts. The findings suggest that practicing shea value addition reduced the probability of selling shea through spot markets by 12.5%. On the other hand, practicing value addition increased the probability of selling shea through informal and formal contracts by 8.6% and 3.9%, respectively. With respect to actor's main occupation, being a farmer was significantly negatively associated with actor's decision to choose spot markets, but significantly positively associated with actor's decision to sell through informal contracts (Table 5). The findings suggest that, being a farmer as opposed to other main occupations, reduced the actor's probability of selling shea through spot markets by 12.3%, but increased the actor's probability of selling shea through informal contracts by 11%.

Results from this study also show that, being a shea collector had a significant positive influence on the decision to choose spot marketing, but a significant negative influence on the decision to choose informal contracts as opposed to being a trader or processor (Table 5). The findings suggest that, being a shea collector, as opposed to being a shea trader or processor, increased the probability of selling shea through spot markets by 39.3%, but reduced the probability of selling shea through informal contracts by 36.7%. Choice of marketing arrangements also varies across actor's geographical location. Results show that being located in Pader district, as opposed to Otuke district had a significant positive influence on the choice of spot marketing, but a significant negative influence on the choice of informal and formal contracts. The findings suggest that, being located in Pader district increased the probability of selling shea through spot markets by 34%, but reduced the probability of selling shea through informal and formal contracts by 28% and 6%, respectively, relative to being located in Otuke district. With respect to distance to the distance to the market point, results show that distance to the market point had a significant negative influence on the decision to choose spot markets, but a significant positive influence on the decision to choose informal contracts (Table 5). Specifically, an increase in the distance to the market point reduced the probability of selling shea through spot markets by 1%, but increased the probability of selling shea through informal contracts by 0.8%.

4 Discussions

This study assessed the choice of shea marketing arrangements used by shea actors. It has demonstrated that different actors prefer different marketing arrangements in the marketing of shea and shea products in northern Uganda. Specifically, the use of spot marketing was more common among the collectors, who, are at the base of the shea value chain. This was expected given that spot marketing is usually more common for among actors at the bottom of the chain [7, 51] such as shea collectors. Tijani [52] made similar observations reporting that over 86% of the shea actors in Tanzania preferred to sell their shea or shea products to local hawkers and consumers. According to Kaimba et al. [53], collectors of non-timber forest products usually prefer market channels that are nearer to them. Consequently, majority of shea collectors prefer spot markets that are usually near their localities. On the other hand, findings from this study has shown that traders and processors preferred informal contracts. The low proportional of actors preferring contracts is attributed their dissatisfaction with contract. This is because such actors are usually too small to negotiate better contract terms [54].

The choice of shea marketing arrangement also varied significantly across location with spot marketing being more common in Pader district, while, formal contracts were more common in Lira district. Differences in choice of marketing arrangements are expected across geographic locations due to differences in transaction costs and information on the different marketing arrangements [10, 53, 55, 56]. These locational differences are linked to the availability of market support functions such as roads (in terms of distance and quality) that influence transaction cost. In this study for instance, Lira district which relatively closer to Lira city had actors with more formal contracts. This could be attributed to Lira city harbouring larger actors who are usually able and willing to provide contracts to small scale shea actors.

A number of factors were identified to be responsible for the observed choice of marketing arrangements used by shea actors in this study. In the shea value chain, there are gender differences in most aspects [57], including in the choice of marketing arrangements. In this study, more experienced shea actors preferred informal contracts, while, less experienced shea actors preferred spot markets. A study by Nwafor [58], reported similar findings in the marketing of cocoyam in south Africa. Kaimba et al. [53] also reported similar findings in marketing of Baobab pulp in Kenya. With experience, comes an understanding of the merits and demerits of each of the shea marketing arrangement. Thus, more experienced shea actors are more likely to prefer marketing arrangements that offer them some stability and flexibility. Generally, more experienced actors already know the marketing arrangements which are associated with higher efficiency [59]. This higher efficiency usually translates into better incomes for the actors.

Additionally, more experienced actors also tend to be more flexible, since through experience, they have learnt what works and what does not. This flexibility may involve having the courage to involve in side-selling which tend to be less likely with formal contracts. Consequently, informal contracts provide these benefits including the possibility of side selling [60] which is a major hindrance to formal contracts [61]. This is partly attributed to differences in risk preferences and actors experience. According to Mishra et al. [62], adoption of contracts varied by risk preferences but was higher for more experienced actors.

Shea actor's levels of education is also influenced their decision on which market arrangement to choose. Findings from this study has shown that an increase in shea actors' level of education was linked to increased likelihood of selling shea and shea products through the formal contracts. Similar findings were reported by Tijani [52] and Kangile et al. [63]. Specifically, Tijani [52] reported level of education was positively related to the shea actor's likelihood of participating in shea contract marketing, while, Kangile et al. [63] reported that an increase in actors education reduced the likelihood of selling to outside villages. Shea actors who are more educated are more likely to understand the terms of the formal contract. This explains, why, in this study, more educated farmers preferred formal contracts.

In this study, an increase in income generated from shea processing, was associated with lower likelihood of participating in the spot markets, but a higher likelihood of using informal contracts. A study by Tijani [52] also reported that income had a positive influence on shea market participation. This finding can be attributed to the volume of trade associated with each marketing arrangements. Spot marketing usually consist of small traders who can only buy relatively smaller quantities of unprocessed shea, on a given market day. Similarly, actors who want to earn more income from shea would adopt strategies that give them the flexibility they need including selling to multiple actors. This is why, in this study, higher shea processing incomes are associated with higher likelihood of informal contracts. On the other hand, an increase in non-shea processing income, was associated with lower likelihood of selling through informal contracts and higher likelihood of selling through formal contracts. Non-shea income shows income diversifications of shea actors. With diversified income, shea actors can afford to sell through formal contracts which sometimes requires them to wait for some time before payments are made. This income diversification which is link to diversification of livelihood activities also implies that such actors having less time negotiating new informal contracts every time. Formal contracts thus present a time-saving options for such actors.

Support to farmers inform of extension, training and provision of information has been shown to impact on the decisions made by actors [7, 52, 64, 65]. In this study, shea collectors who received extension were less likely to sell through spot markets, but, more likely to sell through formal contracts. Extension agents usually act as linkages between contracting companies and shea actors. Such linkages would involve provision of information and creating awareness on the benefits of such marketing arrangements and providing the much-needed information. Similarly, access to information is important for actor's decision making. In this study, results have shown that, shea actors who have access to information were more likely to sell through contracts. Before deciding on a given marketing arrangement, an actor need to be aware of all the terms and conditions involved [66]. Thus, if shea actors have access to information, they are more likely to abandon formal contracts for other marketing arrangements for which they find would benefit them more such as informal contracts that has been reported to provide options for side selling without grave penalties [60, 67]. Most actors have been discouraged from taking contracts after understanding all the necessary terms and conditions [54]. Results of this study has also shown that shea actors who received training on shea processing were less likely to sell through spot markets, but more likely to sell through informal markets. A study by Panda and Sreekumar [68], reported a positive relationship between training and both formal and informal contracts, although access to training increased the likelihood of formal market participation more than it did for informal market participation. Such training programs would make shea actors more competitive, choosing to try new marketing arrangements that may be different from what they have been using before.

Shea actors usually require support in order to attain better market outcomes. This may come in the form of support for value adding activities [13], which in part requires shea actors to be aware of innovations and institutions that support such value adding activities. In this study, shea actors who were aware of institutions that support value addition were most likely to sell through formal contracts, but less likely to sell through informal contracts, as opposed to those who were not aware. Additionally, shea actors who were practicing value addition were more likely to sell through spot marketing, but less likely to sell through informal contracts. This finding suggests that when actors expect some value adding activities, they would prefer marketing arrangements that allows them to negotiate prices which may translate into higher income than when they had used arrangement with relatively fixed terms.

In marketing of agricultural products, availability of transport is one determining factors to the choice of market channels and subsequently marketing arrangement [58, 64, 69, 70]. Transport has great implications on the transaction cost.

In this study, transport was proxied using two the mode of transport and the distance to the market. Specifically, shea actors who used head pottage as their means of transport where less likely to sell through the formal contracts, but more likely to sell through spot markets, as opposed to those who use motorized means of transport. Similarly, shea actors who were living nearer the market point were more likely to sell through spot markets but more likely to sell through informal and formal contracts. This finding suggests that use of head pottage in transporting shea and/or shea products to the market was more feasible for shorter market distances. Spot marketing have a characteristics short market distance. In most cases, spot markets are located within shorter distances from the actor's residence, making it easy for actors who want sell their products fast such as in the case of side selling [67]. This is why, in this study, use of head pottage was associated with selling through spot markets. Additionally, contract marketing was associated longer distance markets. This is so given that in most contracting arrangements, the contracting company are usually found in more urbanized areas, which are far away from the rural areas where collection and local level processing takes place. In this study, most of farmers who used formal contracts were from Lira district, which is more developed that both Otuke and Pader districts.

Access to credit has been shown to improve shea market participation [52] and processing decisions [13]. In this study, access to credit significantly influenced choice of market arrangements of the shea actors. Specifically, shea actors who had accessed credit were less likely to sell through formal contracts. This finding suggests that, shea actors in this study relied on short-term credits usually obtained from villages savings and loan associations. Such credit facilities usually require that the borrower pay within a short time. Consequently, spot marketing provides an immediate solution to the cash requirements for paying such short-term loans. In case of default, such loans usually have grave penalties [71] that shea collectors would want to avoid.

5 Conclusions

Shea nuts are collected from shea trees (*Vitellaria paradoxa*), a naturally occurring parkland tree species. This study assessed the choice of marketing arrangements used by shea collectors, traders and processors in northern Uganda. Results showed that in this study, shea collectors were the majority with most of them preferring to sell their shea products through spot marketing. On the other hand, shea traders and shea processors preferred formal and informal contracts in marketing their shea products. Several factors were identified to be influencing shea actor's choice of marketing arrangement. These factors were both socio-economic and institutional in nature. Efforts to improve shea actors market performance can be achieved by harnessing some of the identified factors. For instance, provision of extension services and creating awareness about institutions that support value addition, would increase shea actor's participation in formal contracts. Similarly, addressing challenges associated with market access by improving transport services would influence choice of certain marketing arrangements over others. On the other hand, provision of training on value addition to shea actors would encourage use of informal contracts, while, providing information to shea actors would discourage use of formal contracts, suggesting the need to improve on the contracting terms if farmers are to take it up. This study recommends the need to customized approaches to promoting uptake of priority marketing arrangements by geographic locations and actor types.

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Author contributions In preparing this Manuscript, DA, AE and DMO Conceived and designed the study; AE provided resources for the study; DA, AK and BM Performed the experiments; DA and DMO Analyzed and interpreted the data; DA, DMO, BM and AK wrote the initial draft. All authors reviewed the paper.

Data availability The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate This study obtained ethical approvals from Gulu University Research Ethics Committee (GUREC) as well as Uganda National National Council for Science and Technology (UNCST). Following guidelines from, GUREC, written informed consent was obtained from all participants prior to participation in the study. Only those who voluntarily consented where included in the study.

Consent of publication All authors have consented to the publication of this manuscript in this Journal. We declare that this manuscript in any form has not been submitted elsewhere for publication.

Competing interests The authors declare no competing interests.

Appendix

See Table 6

Table 6 Multinomial regression results for factors influencing choice of shea nut marketing arrangement

Market arrangement	Coefficient (SE)	
	Informal contract	Formal contract
Male	0.007 (0.382)	−0.111 (0.449)
Experience	0.128 (0.024)***	0.031 (0.033)
Level of education	−0.096 (0.077)	0.197 (0.100)**
Log processing income	0.582 (0.325)*	0.622 (0.278)**
Log non-processing income	−0.334 (0.193)*	0.530 (0.215)
Extension services	0.150 (0.809)	3.186 (0.964)***
Receive trainings	2.023 (0.539)***	−0.210 (0.886)
Receive information	0.476 (0.761)	−2.331 (0.964)**
Means of transport	−0.358 (0.463)	−2.351 (0.793)***
Aware of institutions	−0.993 (0.764)	2.071 (0.645)***
Credit	−0.688 (1.144)	−3.630 (1.649)**
Practice value addition	0.867 (0.489)*	1.426 (0.682)**
Farmer	1.487 (0.761)*	0.607 (0.646)
Collector	−2.280 (0.637)***	−1.258 (0.769)
Lira	0.675 (0.496)	0.301 (0.595)
Otuke	−3.302 (0.752)***	−2.878 (0.757)***
Distance to market point	0.074 (0.021)***	0.064 (0.024)
Constant	−5.531 (3.947)	−17.491 (3.813)***
Number of obs	325	
Log pseudolikelihood	−169.961	
Pseudo r-squared	0.395	
Chi-square	130.131	
Prob > chi2	0.000	

Base category is spot marketing, *SE* Standard error in parentheses, *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

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