

# Transaction Cost of Sunflower Seed Production in Tanzania: Application of Transaction Cost Economics Theory

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## **ABSTRACT**

*This paper analyses the effects of transaction costs of production of the sunflower seeds by small scale farmers in Tanzania. The study utilises cross-sectional farm household data collected from a randomly selected sample of 120 small scale farmers in two central regions of Singida and Tabora in Tanzania. The results showed that transaction cost variables associated with information search and negotiation had negative effect on total output of sunflower seed production while contractual enforcement cost had positive effect on sunflower production. The effects were however not supported statistically (at  $p < 0.05$ ). Transaction costs associated with inputs information, access to means of communication and transportation, had significant negative effects on sunflower seed production. We recommend that policies aimed at improving rural road infrastructure, market information systems, small scale asset accumulation, human capital and promotion of farmer association could reduce transaction costs and enhance sunflower production by small scale commercial farmers.*

**Keywords:** *Transaction cost economics, search cost, negotiation cost, enforcement cost, sunflower production, Tanzania*

## **INTRODUCTION**

Transaction costs exist in all production and market exchanges; and high transport costs, which are an element of transaction costs, are a major deterrent for participation of farmers in Africa, and they affect the price farmers receive as well as their production (Hine and Ellis, 2001). This implies that a reduction in transaction costs can encourage small scale farmers to participate efficiently in production and marketing. In Africa, agricultural commercialisation remains to be marginal as it has been observed that 26% of farmers did not sell any of their crops produced and

so they were not connected to market; with only 25% of farmers selling more than half of their total production (World Bank, 2011). From all these observations it is plausible to argue that the output side of agricultural commercialisation is very low for small scale farmers to experience the associated benefits.

Sunflower is one of Tanzania's most important cash crops grown mostly within the central regions of Tanzania. The country ranks eleventh in the world in sunflower seed production and it is the second largest producer in Africa behind South Africa, accounting for 35% of the continent's total production; yet the country imports nearly 50% of edible oil. African countries account for 5.5 per cent of the world's production (FAOSTAT, 2018). Furthermore, statistics show that local production of both factory and home extracted sunflower seed oil in Tanzania contributes about 40% of edible oil requirement of 330,000 tones implying that the 60% supply gap is filled by imports.

Sunflower oil is one of the most popular oils in the world, in Tanzania sunflower production offers multiple livelihood opportunities, as it produces important and valuable vegetable oils and animal feeds that are sold to internal and external markets (Ugulumu E.S.; Inanga E.L., 2014). It is estimated that about 4 million small scale farmers engage in sunflower production (URT, 2013). Sunflower is grown in most regions across Tanzania as the crop is drought resistant and less susceptible to diseases; consequently, the semi-arid areas of the central zone and the southern coast of Tanzania are most favorable for sunflower production (Kajimbwa et al., 2010).

In African tropical countries, Tanzania production stands at 108 000 MT per annum, Sudan (18 000 MT), Kenya (12 000 MT), Angola, Mozambique, and Zambia (each about 11 000 MT). Most of the sunflower oil is consumed in these countries of origin and less than 30% reaches the international markets. Low exports of sunflower oil are attributed to high demand in domestic markets, low quality and standards which restrict entrant to international markets, and low output of most small-scale processors (Berglund, 2015). In Tanzania, agriculture continues to be the main backbone of the economy of most of the rural population. According to URT (2008) over 80% Tanzanians live in rural areas where agriculture and the use of natural resources are crucial to their livelihoods. Sunflower represents one of the key sub-sectors of

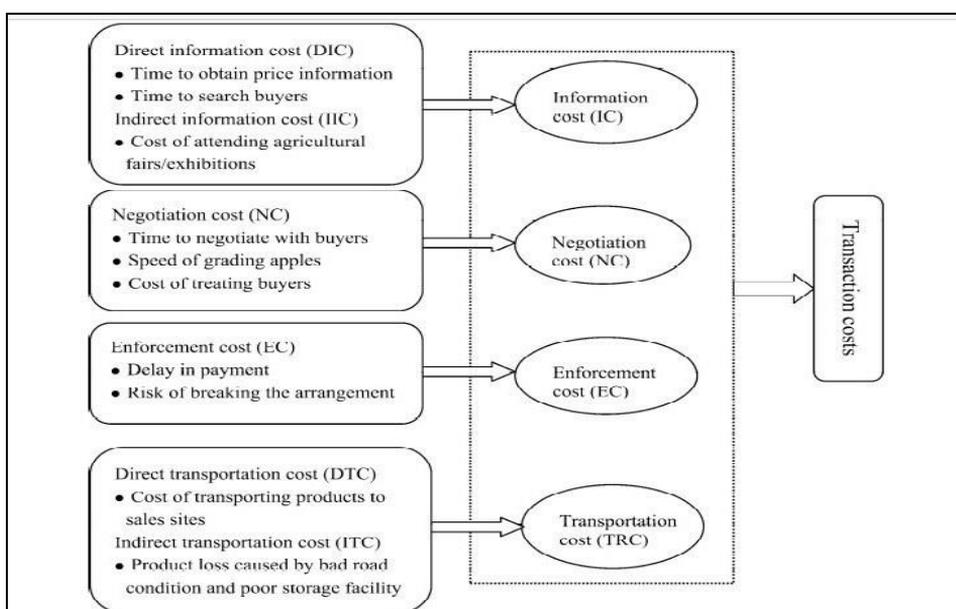
agriculture in Tanzania (RLDC 2008). Globally, the leading commercial producers of sunflower seeds includes Russia, Peru, Argentina, Spain, France and China (The George Mateljan Foundation, 2001-2010). Irrespective of its relevance in understanding determinants of transactions in developing countries, the application of Transaction Cost Economics (TCE) theory in thin markets has been minimal especially in agrarian economies. As a result, explanation of what could explain commercialised agricultural production in the country is lacking. The overall objective of this paper therefore, is to apply TCE theory in identifying the different forms of transaction costs and assessing their relative effects on sunflower seed production in Tanzania.

### **Transaction Cost Economics Theory and its Application**

Since Williamson proposed the TCE theory in 1970s, a number of researchers have used it in a variety of relationships. Williamson, focuses on how the characteristics of a transaction affect the costs of handling it through production, markets, bureaucracies, and other forms of organization. A transaction occurs whenever a good or service is transferred across a technologically separable interface (Williamson, 1985). According to Williamson (opt cit), transaction costs can be classified into observable (explicit) and unobservable (implicit) or inhibitive transaction costs. The observable transaction costs, which include production costs such as transport, handling, packaging, and storage, affect the magnitude of output. The unobservable transaction costs, which include cost of information, search, bargaining, screening partners or customers, monitoring, coordination, and enforcement are inhibitive. The other delineation of transaction costs is *ex ante* fixed and proportional transaction costs. Ex ante fixed transaction costs are the same regardless of the magnitude or level of transactions made. An example of ex ante fixed costs is information cost on inputs, which would remain the same regardless of the amount of produce a farmer sells after the market information has been obtained (Yustika, 2008).

From yet a different perspective, Wang and Huo, (2013) and Key et al., (2000) define transactions costs as fixed and proportional (or variable) transaction costs. Here fixed transactions costs include the original search, negotiation and enforcement costs that are invariant to the volume of input as well as output. However, with respect to sunflower production, there is need to use a narrower definition of transaction costs which provides a clear relationship with search, negotiation and enforcement

costs in sunflower production. In this context, the definition by Staal et al, (1997) who classify transaction costs into observable and unobservable transaction costs is used. The observable transaction costs include marketing costs such as transport, handling, packaging, storage, spoilage etc. that are visible when a transaction takes place. Unobservable transaction costs include cost of information search, bargaining, and enforcement of contracts etc. The adopted framework of Transaction Costs underpinnings of why the transaction costs effect sunflower seed production can be found in the transaction costs theory as postulated by Williamson (Siziba et al., 2011).



**Figure 1: Adoptive Framework of Transaction Costs**

Source: Modified from Wang and Huo (2013)

A number of studies, such as Key et al., (2000) and Makhura et al., (2001) have identified high transaction costs as one of the key reasons for small scale farmers to participate in production, though they accorded attention to the global production of oil and seed shows that, sunflower industry is dominated by a few large global players, characterized by large, mechanized farms with easy access to inputs and funding. The study investigated the role of proportional and fixed transaction costs on farmers' market participation and supply volume decisions. Key et al. (2000) show that maize production in Mexico is not only associated with

agricultural mechanization, use of high-yield inputs, and price, but also with selling to official sources and membership of agricultural organizations, implying lower proportional transaction costs. The marketable production threshold was significantly associated with pick-up truck ownership, i.e., higher fixed transaction costs (Key et al., 2000).

A study conducted by Hobbs and Young (2000) stated that product perishability also complicates transaction, and raises transaction cost. Shiferaw et al. (2009) identified low volume as one of the major factors limiting the success of small-scale marketing groups in Kenya. Though numerous studies have accorded attention to the effects of transaction costs on small scale farmers, not many foci on how they affect small scale paddy farmers. In Niger, Aker (2008) has shown that mobile phone use among grain sellers led to significant reductions in grain-price dispersion net of transport costs across production and markets of small-scale farmers in Niger.

Baloyi (2010) conducted a study on analysis of constraints facing small scale farmers in the agribusiness value chain in Tanzania; the study discussed the factors such as lack of human capital, high transaction cost, lack of information on markets, transport problems, technological barriers. The study discovered that many small-scale farmers were illiterate, with poor technological skills, which seemed to be obstacles in accessing useful formal institutions that can disseminate technological knowledge. It shows that majority of emerging producers lack knowledge on financial and marketing skills and it was found that producers were not able to meet the quality standards set by fresh produce markets and food processors. Further, Ugulumu, and Inanga (2014) argue that reducing transaction costs can significantly unlock the limited market participation by small scale farmers.

## **METHODOLOGY**

### **Data and Sampling Design**

Cross section data were collected from a survey of 120 randomly selected small-scale farmers in two districts of Mkalama and Igunga in Singida and Tabora regions of central Tanzania. The study confined in collecting quantifiable transaction cost determinants of Commercialised production of sunflower seeds. A formula for simple determination proposed by Tabachnick and Fidell (2007) was used to come up with a sample size. Tobachnick and Fidel (opt cit) suggest a formula:  $N > 50 + 8m$  for

multivariate data analysis where  $N$  is the number of sunflower producers target population and  $m$  is the number of independent variables.

### **Theoretical Model Formulation**

The transaction cost economics (TCE) and neo-classical economics (NCE) theories assert that the producer maximises profit subject to some technical and institutional constraints (Meyer, 2006). A farmer will thus, choose level of output and set of inputs in such a way that a maximum profit ( $\pi$  Max) is realized. The production maximization function with consideration of transaction cost as an exogeneous factor is as presented in equation (1).

$$MaxU(C_i, T_i^c) \dots\dots\dots 1$$

Equation (1) is assumed possible subject to income, resource and transaction cost constraints as indicated in equations 2-5. Income Constraints equation is thus as presented in Equation (1), whereas the resource constraints equation is represented in Equations (2) and (3).

$$A + \sum_{i=1}^N P_i^c B_i \geq \sum_{i=1}^N P_i B_i \dots\dots\dots 2$$

$$Q_i + E_i + B_i \geq K_i + C_i + S_i \dots\dots\dots 3$$

Equations (4) and (5) present transaction costs of production constraints

$$G(Q_i, K_i, Z^q) = 0 \dots\dots\dots 4$$

$$C_i, Q_i, S_i, B_i, K_i \geq 0 \dots\dots\dots 5$$

Where;

$T_i^c$  = Transaction costs

$P_i$  = Total production of good i

$A$  = Exogenous factors

$Z^c$  = Farmer characteristics

$Z^q$  = Transaction costs characteristics of production

### Model Estimation Method

Due to the continuous nature of dependent variable (quantity of sunflower seed produced by small scale producer) an Ordinary Least Square (OLS) method was used to estimate the Multivariate Linear Regression Model of transaction costs sunflower determinants of sunflower seed production. An econometric form is adopted as shown in equation (6) and the estimates  $\beta^i$  for the vector of variables capturing the factors determining  $L_i$ , which include transaction costs related factors (i.e., access to information, negotiation, and law enforcement to loans), are obtained.

$$L_i = \sum_{i=1}^{i=n} (x_i \beta) + \mu_{li}$$

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Where,

$L_i$  = the intensity output (the quantity of sunflower production)

$x_i$  = independent variables (transaction costs) affecting sunflower production

$\beta$  = coefficient estimates of the independent variables, and

$\mu_{li}$  = the error term for the regression equation

In the current study conceptual framework integrates output and transaction costs in the choice of production channels. For the current study, the functional form of the classical multivariate regression model is represented in equation (7) and its loglinear form in equation (8).

$$Y_i = \beta_0 + \sum_{i=8}^8 \beta_1 \ln Searchcost + \sum_{i=5}^5 \beta_2 \ln Negocost + \sum_{i=2}^2 \beta_3 \ln Enforcost \quad \dots\dots\dots 7$$

$$\ln Y_0 = \beta_0 + \beta_1 \ln Searchcost + \beta_2 \ln Negocost + \beta_3 \ln Enforcost \quad \dots\dots\dots 8$$

Where Y refers to total number of bags of 70kg (TONUBA)

### Effect of Search Transaction Cost on Sunflower Production

In this study Search cost (Searchcost) =  $f$  (seeding, deciding, preparing land and planting, harvesting, packing and storing, selling). Hence holding negotiation cost (Negocost) and enforcement cost (Enforcost)

constant, the effect of search transaction (Searchcost) cost can be rewritten as in equation (9).

$$\ln Y_{i_t} = \beta_0 + \beta_1 \ln(\text{Seedcost}) + \beta_2 \ln(\text{Decidecost}) + \beta_3 \ln(\text{PrepLandcost}) + \beta_4 \ln(\text{Inputcost}) + \beta_5 \ln(\text{Harvestcost}) + \beta_6 \ln(\text{Pack cost}) + \beta_7 \ln(\text{Storecost}) + \beta_8 \ln(\text{Sellcost}) \dots \text{eqn}_2$$

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Where,

Seedcost = transaction cost of finding information about a particular type of seed and cost of traveling to purchase seeds if the seeds were not available.

Decidecost = transaction cost of decision by farmers to phone-call to agricultural officers to find information about the sunflower farming.

Preplandcost = transaction cost of finding labour and cost of finding machines to prepare the land for farming.

Inputcost = transaction cost of finding fertilizer, pesticides, weeds etc. and cost of traveling to purchase fertilizer, pesticides, weeds etc. if those were not available.

Harvestcost = transaction cost of harvesting and finding storage, packing materials.

Packcost = transaction cost of packages and packaging sunflower seeds in the required quantities

Storecost = transaction cost of storing sunflower seeds and associated conditionalities

Sellcost = transaction cost of comparing prices of different traders and costs of finding transport.

### **Effect of Negotiation Transaction Cost on Sunflower Production**

The second component in equation (8) is negotiation transaction costs (Negocost) that are more related costs to access to the right information. In this study  $\text{Negocost} = f$  (Payment for land hiring, transportation of inputs, writing the contract, waiting time at bank for loan receiving, bargaining power of buying inputs). Thus, holding Searchcost and Enforcost constant, then equation (8) can be represented as shown in equation (10).

$$\ln Y_{2i} = \beta_0 + \beta_1 \ln Land\ cost + \beta_2 \ln Inputs\ cost + \beta_3 \ln Contract\ Writing\ cost + \beta_4 \ln Bank\ cost + \beta_5 \ln Bargaining\ cost$$

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### Effect of Enforcement Transaction Cost on Sunflower Production

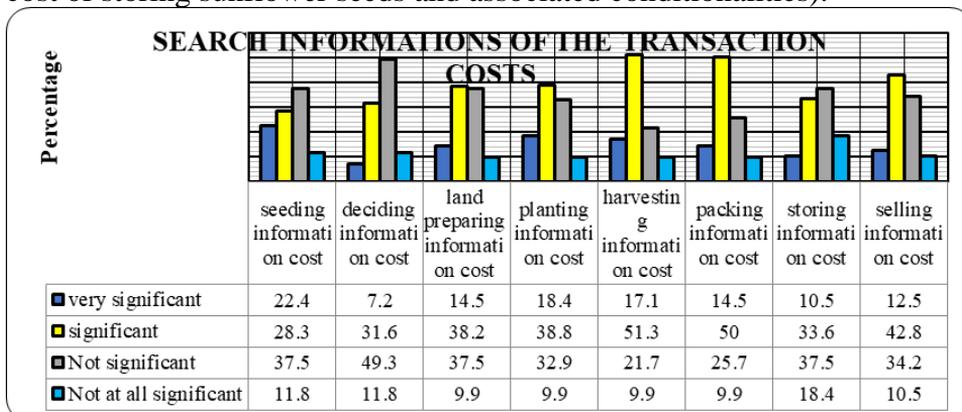
Enforcement transaction costs (Enforcost) include cost of monitoring (contract enforcement) of sunflower seeds production. In this study enforcost is referred to the cost of collecting the payment from buyers in terms of days to receive payment from buyers and from cooperatives. Thus equation (8) is rewritten as shown in equation (11)

$$\ln Y_{3i} = \beta_0 + \beta_1 \ln No.\ day\ store\ c\ ave\ Payment + \beta_2 \ln No.\ days\ for\ Re\ ceiving\ Payment\ from\ Cooperative \dots\dots\dots 11$$

## FINDINGS AND DISCUSSION

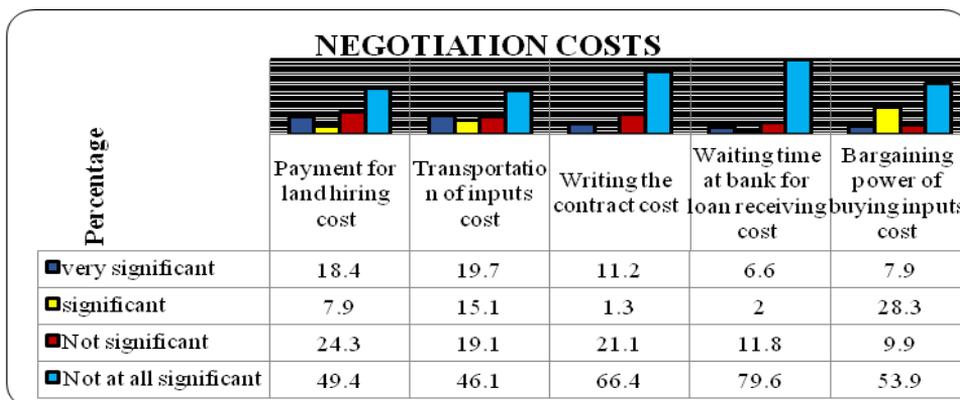
### Description of Transaction Cost Determinants

Figures 2-4 summarise small scales farmers’ perceptions on significance of various determinants of transaction cost dimensions. It can be learnt from Figure 2 that unlike other search cost determinants, majority of farmers felt that two determinants of search cost were not as significant as other determinants. The two determinants are Decidecost (transaction cost related to the decision by farmers to phone-call agricultural officers to find information about the sunflower farming) and Storecost (transaction cost of storing sunflower seeds and associated conditionalities).

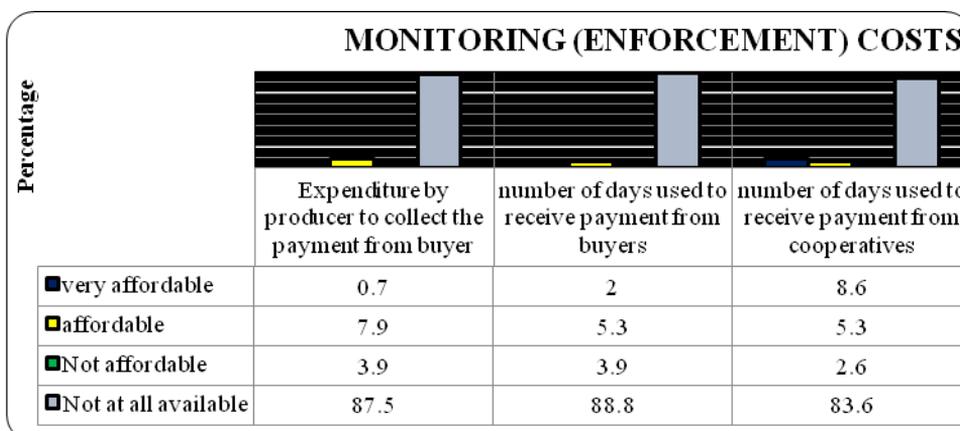


**Figure 2: Farmers’ perceptions on significance of Search transaction cost determinants**

Figure 3 suggests that overwhelming majority of farmers did not perceive any of the negotiation cost determinants significantly affecting their overall negotiation cost hence their resultant effect on sunflower production. On the other hand, Figure 4 shows that all the enforcement cost determinants were found not affordable at all by small scale farmers.



**Figure 3: Farmers' perceptions on significance of Negotiation transaction cost determinants**



**Figure 4: Farmers' perceptions on significance of Enforcement transaction cost determinants**

### Multivariate Regression Analysis Results

Regression analysis results which reflect structural equation models (8) – (11) are presented in tables 1-4 respectively. Table 1 shows that of all the three dimensions of transaction costs (search cost, negotiation cost and enforcement cost) were statistically insignificant. Though insignificant, only enforcement transaction cost had positive effect on sunflower seed

production. The effect of search and negotiation transaction cost had negative, though insignificant. These results suggest that sunflower seeds production increases with decrease in search and negotiation transaction costs but with an increase in enforcement cost. These findings are in-line with the transaction cost economics theory. Increase in contract enforcement gives assurance for both farmers and buyers of the successful deals since a farmer may be dealing with more than one supplier of production inputs in advance of harvest. However, as noted earlier, the relative effect of these costs is not only minimal but very insignificant.

**Table 1: Overall econometric model (Equation 8) estimation**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	48.774	15.602		3.126	.002		
SEACOST	-.663	.396	-.150	-1.672	.097	.803	1.245
NEGOCOST	-.693	.623	-.103	-1.113	.267	.748	1.337
ENFCOST	.011	1.287	.001	.009	.993	.923	1.083

Dependent Variable: TONUBA  
 Significant at P = 0.05

Tables 2-4 presents econometric results for models (9) – (11) respectively which represent decomposed determinants of each of the three dimensions of total transaction cost on sunflower seeds production. Three determinants of Search negotiation cost (SEDCOST DECICOST, PLANTCOST, PACKCOST and STOCOST) had positive effect on sunflower seed production whereas the rest had negative effect. However, none of the search cost determinants had individual significant effect on sunflower seed production. Transaction cost of negotiating for a bank loan (BALOCOST) which was measured as waiting time at bank for loan had negative impact on sunflower seed production and the effect was statistically significant. This could be due to the fact that more time a lender stays with the farmer borrower the less the time a farmer spends in production. Like for Search cost, all the determinants of enforcement

transaction cost had effects on sunflower seeds which were statistically insignificant. Whereas REPACOCOST had positive effects, the other two determinants of enforcement cost had negative effects on sunflower seed production.

**Table 2: Econometric Model (9) estimation for search costs**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	39.270	8.162		4.811	.000
SEDCOST	.053	4.531	.002	.012	.991
DECICOST	3.176	5.428	.091	.585	.559
PRELACOST	-9.086	7.054	-.286	-1.288	.200
PLANTCOST	3.157	6.973	.103	.453	.651
HARVECOST	-5.808	6.973	-.182	-.833	.406
PACKCOST	.748	6.961	.023	.107	.915
STOCOST	3.573	4.702	.118	.760	.449
SELICOST	-2.659	4.500	-.082	-.591	.556

Dependent Variable: TONUBA

Significant at P = 0.05

**Table: 3 Econometric model (10) estimation for negotiation costs**

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	58.127	10.157		5.723	.000
LAHICOST	.702	2.578	.030	.272	.786
TRANICOST	2.256	2.430	.098	.929	.355
WRICOST	-.694	3.730	-.025	-.186	.853
BALOCOST	-10.446	3.632	-.313	-2.876	.005
BARPOCOST	-.500	2.464	-.020	-.203	.839

Dependent Variable: TONUBA

Significant at P = 0.05

**Table 4: Econometric model (11) estimation for enforcement costs**

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	19.580	15.676		1.249	.214
EXPCOST	4.622	4.353	.103	1.062	.290
REPACOST	.645	5.178	.015	.125	.901
REPACOCOST	-4.062	3.073	-.138	-1.322	.188

Dependent Variable: TONUBA

Significant at  $P = 0.05$

## CONCLUSION

It is shown in this study that the coefficients of the search information costs were negative implying that increase in transaction cost due to search information costs causes a decrease in production, though statistically insignificant ( $P > 0.05$ ). The statistical result in negotiation of transportation of inputs cost (NEGOCOST) implies that an increase in negotiation cost leads to a decrease in sunflower produced. However, this effect is also insignificant statistically ( $p < 0.05$ ). Lastly, regression results show the effect of enforcement cost (ENFCOST) is positive though statistically insignificant ( $P > 0.05$ ). These results conform to the mainstream TCE theory which postulates among others that increase in transaction costs associated with enforcement cost in thin economies may be necessary for transaction to happen. This suggests that there is need for more enforcement of contracts between upstream suppliers of service providers and farmers on one hand, but also between farmers and downstream input suppliers.

Proportional transaction costs associated with inputs information access and negotiation cost, have negative effects on sunflower production. Similarly, fixed transaction costs associated with inputs information, such as access to communication assets and ownership of transport, have significant effects on output. These findings are in conformity with some of the other research applying TCE (see for example Ngaruko & Lwezaula. 2013; Nguvava & Ngaruko, 2016; Sonda & Ngaruko; and Mutayoba & Ngaruko, 2018). Providing better access to inputs by

improving road infrastructure could be an important policy option to reduce transaction costs and enable the small-scale producers to realise the benefits associated with sunflower production. Improving information and communication services could also enhance production by small scale sunflower farmers. The importance of public assets and services such as farmer association and the availability of credit to financial institutions will also influence sunflower farming participation and marketed surplus. All these initiatives and services call for promotion of institutional innovations and improving credit delivery systems for boosting commercialised sunflower production.

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