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## INFLUENCE OF TRANSACTION COSTS ON CHOICE OF MARKETING OUTLETS AMONG SMALLHOLDER PEACH FARMERS IN LESOTHO

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### ABSTRACT

Peach (*Prunus persica*) production is a major agro-economic activity in Lesotho. However, most smallholder peach farmers in Lesotho still fail to reap the benefits that are in line with peach commercialization. This is because of high transaction costs, which vary along with different peach marketing outlets. This study was conducted to determine the influence of transaction costs on the choice of marketing outlets of peaches in Lesotho. A multistage sampling technique was used to select 90 respondents for this study. Cross-sectional data were collected using a semi-structured questionnaire. A Multivariate probit model was used to analyse transaction costs influencing the choice of marketing outlets among smallholder peach farmers. The study revealed that gender and communication costs positively influenced the choice of farm gate; while the time taken to reach other outlets and average monthly income negatively influenced the choice of farm gate outlets. Sorting, grading and communication costs negatively impacted the local market; whereas, the average monthly income positively influenced it. Household size influenced farmers' export market choice negatively. Evidence from the results suggests that the improvement of roads and communication infrastructure could enhance farmers' income through the proper selection of marketing outlets. Access to market information regarding both distance and the time taken to reach each of the outlets should also be improved.

*Key Words:* Farm gate, multivariate probit, *Prunus persica*

### RÉSUMÉ

La production de pêche (*Prunus persica*) est une activité agro-économique majeure au Lesotho. Cependant, la plupart des petits exploitants de pêches au Lesotho ne parviennent toujours pas à

récolter les avantages qui sont en ligne avec la commercialisation des pêches. Cela est dû aux coûts de transaction élevés, qui varient en fonction des différents points de vente de pêche. Cette étude a été menée pour déterminer l'influence des coûts de transaction sur le choix des débouchés commerciaux des pêches au Lesotho. Une technique d'échantillonnage à plusieurs degrés a été utilisée pour sélectionner 90 répondants pour cette étude. Les données transversales ont été collectées à l'aide d'un questionnaire semi-structuré. Un modèle probit multivarié a ensuite été utilisé pour analyser les coûts de transaction influençant le choix des débouchés commerciaux parmi les petits exploitants de pêches. L'étude a révélé que le sexe et les coûts de communication ont eu une influence positive sur le choix de la ferme; tandis que le temps nécessaire pour atteindre d'autres points de vente et le revenu mensuel moyen ont influencé négativement le choix du point de vente à la ferme. Tri, classement et les coûts de communication ont eu un impact négatif sur le marché local; tandis que le revenu mensuel moyen l'a influencé positivement. La taille des ménages a influencé négativement le choix du marché d'exportation des agriculteurs. Les résultats des résultats suggèrent que l'amélioration des routes et des infrastructures de communication pourrait améliorer les revenus des agriculteurs grâce à une sélection appropriée des débouchés commerciaux. L'accès aux informations du marché concernant à la fois la distance et le temps nécessaire pour atteindre chacun des points de vente devrait également être amélioré.

*Mots Clés:* Ferme, probit multivarié, *Prunus persica*

## INTRODUCTION

Peach (*Prunus persica*) is a crop of growing importance in southern Africa, particularly in Lesotho. Its production was rated at approximately 23,000 metric tonnes in the year 2017/18 (World Food Programme (WFP), 2017). In Lesotho, the production of peaches dates to early 1800 upon the arrival of the missionaries. The peach sector has reportedly contributed approximately 43.77%, equivalent to US\$ 71, 429 to the total gross value of all deciduous fruits (US\$ 285, 714 ) in Lesotho (World Food Programme(WFP), 2017). According to Sekoai and Rantlo (2016); most of the smallholder peach farmers generate income through sales of dried peaches in both domestic and foreign (South African) markets. The other farmers, as well as farmers' associations were earlier reported to sell both processed and unprocessed peaches in informal and formal markets (FAO, 2014). Thus, Lesotho is one of the developing countries that still perform marketing functions traditionally.

Majority of smallholder peach farmers in the country are located in remote areas, with poor infrastructure. As a result, they often fail

to participate in markets due to high transportation costs and lack of guaranteed markets (Rafoneke and Rantlo, 2016; Sekoai and Rantlo, 2016). High transaction costs restrict the potential gains from current opportunities that are in line with commercialisation of peaches in the country. Moreover, marketing plays a significant role in transforming smallholder farmers into commercial producers as the availability of markets serves as an incentive for farmers to increase their scale of production. The issue of how farmers select marketing outlets, in light of transaction costs, has received little attention in Lesotho. It is through identification of marketing outlets that policy makers can get useful information for formulating marketing policies which are of benefit to smallholder peach farmers and the entire peach fruit value chain in Lesotho.

Owing to the nature of African farming communities, most farming activities take place in remote rural areas where smallholder peach farmers often fail to sell in high value markets due to high transaction costs and limited market options (Key, 2000; Jagwe, 2011; Okoye *et al.*, 2016). The objective of

this study was to determine the influence of transaction costs on the choice of marketing outlets among the smallholder peach farmers in Lesotho.

**METHODOLOGY**

**Study area.** This study was conducted from July to August 2019 in Leribe district, one of the ten districts of Lesotho. The district covers an area of 2,828 Km<sup>2</sup>, between longitude 28° 53' 0" South and latitude 28° 3' 0" East (Moeletsi and Walker, 2013). Leribe District is made up of three agro-ecological zones; lowlands (42%), highlands (30%) and foothills (28%) (LGNSP, 2009). The district has thirteen constituencies, out of which five were selected for the study.

**Sample selection.** A survey was conducted using a semi-structured questionnaire. Reliability and validity of the data collection tool were tested by test-retest correlation and construct validity method, respectively. Consequently, the errors were corrected before using it in the final data collection. A multistage sampling technique was used to select five constituencies (Pela-Tsoeu, Leribe, Hlotse, Tsikoane, and Kolonyama), from which the study sample was drawn. A list of all farmers in the selected constituencies was obtained from the Department of Horticulture in the Ministry of Agriculture and Food Security. Out of the peach farmers' list, only 90 semi-commercial peach producers who had 60-150 peach trees in their farms were selected for the study. Data on both qualitative and quantitative attributes, marketing costs and other market-related prices, as well as marketing outlets were collected.

**Econometric model.** To determine the influence of transaction cost factors on the choice of marketing outlets, a multivariate probit model was used. The model was chosen since the dependent variable was discrete with three levels (farm gate, local and export market

outlets), and only farmers' choice on a particular outlet was observed. Hence, the latent univariate logit model for choice of each outlet was specified as described by Greene (2012) and Adugna *et al.* (2019).

$$y_i^* = X\beta + \mu_i \dots\dots\dots \text{Eq. 1}$$

$$y_i = \{1 \text{ if } y_i^* = X\beta + \mu_i > 0; 0 \text{ if } y_i^* \leq 0\} \dots\dots\dots \text{Eq. 2}$$

Where:

$y_i^*$  was a binary latent (unobserved variable) for marketing outlet choice which was observed when  $y_i^* > 1$ , 0 otherwise;  $X$  was regarded as a vector of transaction costs influencing peach farmers' choice on the marketing outlets.

However, since peach farmers choose one or more market outlets at the same time, they get subjected to the anticipated benefits and risks correlated with each marketing outlet (Adugna *et al.*, 2019). The multivariate probit model allows for free correlation between the error terms, while making it possible to simultaneously frame the impact of a ray of predictor variables on each of the different marketing outlet choices (Mokhtarian and Tang, 2011; Arinloye *et al.*, 2012). Since in practice, scientists and researchers often deal with multiple correlated multinomial decisions consisting of two or more possible choices (Bel and Paap, 2014), the multivariate probit model was employed to estimate M-equation probit models, by the method of maximum simulated likelihood (Cappellari and Jenkins, 2003). Hence, this reduced the biasness as a result of correlation between the choices (Train, 2009; Washington *et al.*, 2020).

In this study, the marketing outlet choice was regarded as a system of multiple-choice equation respective to each type of marketing outlet, as outlined in Adugna *et al.* (2019). The marketing outlets at the disposal of farmers were presumed to be farm gate, local market

and export market, which were econometrically expressed as:

$$Farmgate_i^* = X_1\beta_1 + \epsilon_{1i} \dots\dots\dots Eq. 3$$

$$Localmarket_i^* = X_2\beta_2 + \epsilon_{2i} \dots\dots\dots Eq. 4$$

$$Exporter_i^* = X_3\beta_3 + \epsilon_{3i} \dots\dots\dots Eq. 5$$

The multivariate probit approach was used to estimate several correlated binary outcomes jointly. Generally, the multivariate logit model is expressed as:

$$y_{im} = \beta_{im}X_{im} + \epsilon_{im} \dots\dots\dots Eq. 6$$

Where:

$y_{im}$  with  $(m = 1...k)$  = dependent variable of peach market outlet selected by  $i^{th}$  farmer (The variable was of polychotomous in nature).  $X_{im}$  is  $1 \times k$  matrix reflecting independent variables that affect marketing outlet choice;  $\beta_{im}$  is  $k \times 1$  vector of unknown parameters to be estimated and  $\epsilon_{im}$ ,  $m = 1...m$  were error terms distributed as multivariate normal, each with a mean of zero and Covariance  $V$ , with values of one in the leading diagonal and correlation.

Hence this became a system of equations 7-9:

$$y_{1i}^* = X_1\beta_1 + \epsilon_{1i} \dots\dots\dots Eq. 7$$

$$y_{2i}^* = X_2\beta_2 + \epsilon_{2i} \dots\dots\dots Eq. 8$$

$$y_{3i}^* = X_3\beta_3 + \epsilon_{3i} \dots\dots\dots Eq. 9$$

The dependent variable was observed through the decision to participate in marketing of peaches or not, such that:

$$y_{im} = \begin{cases} 1 & \text{if } y_k^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad k = 1, 2, 3, \dots\dots\dots (10)$$

Multicollinearity test was conducted on the predator variable to detect the problem of

correlation between explanatory variables. The presence of multicollinearity leads to inflated standard errors and hinders the potential of significance in predictor variables (Akinwande *et al.*, 2015). The Variable Inflation Factor (VIF) was computed on the variables to be used in the model to check for the presence of correlation. A weak correlation between the variables was detected and confirmed by VIF value of less than ten (Yoo *et al.*, 2014).

Breusch-Pagan/Cook-Weisberg test for heteroscedasticity was also conducted. The test results showed the  $Prob > Chi^2 = 0.0000$  for OLS model, which indicated the presence of heteroscedasticity. Therefore, the study rejected the null hypothesis at both 90 and 95% significance level, and concluded that residuals were not homogeneous. Due to the non-homogeneity of residuals, the Robust Standard Errors (RSE) were used to deal with the problem of heteroscedasticity (Stock and Watson, 2008).

**Specification and description of variable.**

From Table 1, farm size, gender, age, education level, household size and income level of farmers were variables adopted from Osebeyo and Aye (2014), expected to have a positive influence on the farmers’ choice of peach marketing outlet. Farm size (Fsize), was expected to have a positive influence on farmers’ decision to sell at farm gate, partnering with middlemen or exporting. Gender (coded as gender) was captured as a dummy, which was measured by assigning one (1) for a male farmer, and zero (0) for a female. Gender was expected to influence the market outlet choice positively or negatively; different gender negotiates differently in different markets.

Age (coded as age) of the farmers was captured as a continuous variable. Therefore, it was expected that older farmers had more experience gained over years, hence a farmer may decide to sell to traders or export a product based on the profits each outlet offered. Household size (Hsize), was captured as a

TABLE 1. Description of variables used in the econometric model

Code	Measurement	Expected signs		
		FG	LM	Exp
<b>Dependent variable</b>				
MrkOutChc	1 if Farm gate (FG) 2 if Local market (LM) 3 if Exporter (Exp)			
<b>Independent variables</b>				
Fsize	Number of hectares per farm land	+	+	+
Gender	Dummy (1=Male, 0=Female)	+	+	+
Age	Continuous (Years)	+	+	+
Hsize	Continuous (number of heads/family)	+	+	+
Incom	Average monthly income earned in maloti (M)	+	+	+
Negtxn	Hours spend negotiating price, volume and gardens	+	-	-
Tm <sub>R</sub> outlets	Time taken in hours to reach other outlets	+	-	-
LfCArr	Money paid on arranging contracts	+	+/-	+/-
VolLos	kg lost due to spoilage while selling in other outlets	+	-	-
ComCst	Amount of airtime spend on the communication	+	-	-
SrtGrdC	Money paid per head/g	+	-	-

continuous variable; indicating the number of heads per household. In this way, the outcome was that the family with more heads was more likely to sell in the local market, since the members could help in carrying the peaches to the market. Likewise, families with high level of income (Incom), were expected to sell in almost all of the market outlets, as income served as investment incentive in this study.

Negotiation (Negtxn), was captured by the number of hours a farmer spent negotiating on selling price, quality and quantity. It was, therefore, anticipated to affect the marketing decision either negatively or positively (Maina, 2015). Time taken to reach outlets (Tm<sub>R</sub> outlets) was captured as a continuous variable in terms of hours taken to reach marketing outlets from the farm gate. Hence, was expected to have influenced the choice of farm gate positively and the choice of both local and export markets negatively. Legal fees for contractual

arrangements (LfCArr), on the other hand, was recorded as the amount of money paid to arrange contracts between farmers and agents. Since contract arrangement guarantees the farmers a ready market, it was expected to positively influence the market outlet choice (Sigei *et al.*, 2014).

The volume of peaches lost due to spoilage and theft (VolLos) was captured as the number of kilogrammes lost during selling season and was expected to have a negative influence on the choice of market outlet (Wosene *et al.*, 2018). Communication costs (ComCst), was recorded as the amount of money spent on communication and advertisement per month. It was expected to affect the choice either positively or negatively. Costs for sorting and grading (SrtGrdCst) adopted from Ogada *et al.*, 2018, was captured in monetary terms and expected to influence farm gate choice

positively, and negatively influence choices of other market outlets.

## RESULTS AND DISCUSSION

Results of the multivariate analysis are presented in Table 2. The expected multivariate interdependence of selecting marketing outlets; namely, farm gate, local market and export market showed the likelihood ratio test (Rho-values), of  $\rho_{21} = \rho_{31} = \rho_{32} = 0$  which was statistically significant at  $P < 10\%$ . As such, the null hypothesis, which postulated that all  $\rho$  (Rho) values were jointly equal to 0; was rejected, implying the goodness-of-fit of the model and indicating that the decisions on the choice of market outlets were interdependent.

Table 2 shows that gender, time taken to reach other market outlets, average monthly income and communication costs were significant for choice of the farm gate market outlet ( $P < 0\%$ ). At the local market outlet, sorting and grading costs, average monthly income and communication costs were also significant; while household size had influence on the choice of export market outlet ( $P < 5\%$ ). Some these variables (gender, household size, average monthly income, communication, sorting and grading costs) were in line with economic hypotheses stated previously under the variable description section, while others were not.

Gender had a significant ( $P < 0.01$ ) positive effect on the choice of selling at farm gate only. *Ceteris paribus*, being a male farmer increased the chance of selling at farm gate by 79%, reflecting that male farmers were more likely to sell their produce at farm gate. This finding also indicates some capital disparities in terms of farm land ownership between the male and female peach farmers since farm gate sellers sold in larger quantities as observed in the study of Abu *et al.* (2016).

Household size had a significant ( $P < 0.05$ ), but negative impact with respect to the choice of the export market outlet (Table 2). All things equal, a one-member increase in household size

generally reduced the probability that a household would choose export market by 13.1 per cent. The result implies that farmers with large household sizes were less likely to sell produce in export market, due to high consumption levels, which are attributed to low marketable surplus to meet high value market outlet demand such as export market outlet demand.

Time taken to reach other outlets was found to have a significant negative influence on choice of farm gate market outlet ( $P < 0.05$ ) (Table 2). Holding all things constant, this finding indicates that a minute increase in the time taken to reach other market outlets reduces the likelihood of choosing farm gate by 1.4%. This is probably because most of the consumers in Lesotho reside in semi-urban and urban areas, where there is high demand for peaches since most dwellers do not own land to produce the crop. Furthermore, high peach prices give a farmer an incentive to choose other outlets, regardless of transportation costs that are in line with longer travel times (Vorley and Lançon, 2016; Jebesa, 2019). This implies that, longer distance did not override farmers' motives for choosing local and export marketing outlets due to high market prices and high access to market, and price information that are associated with market outlets (Abu *et al.*, 2016). This finding is in agreement with other studies (Fafchamps and Hill, 2005; Hill and Vigneri, 2014; Mugisha *et al.*, 2016), which found out that farmers' access to information, as well as low transportation costs, relative to market outlet prices, may lower the chances of farmers selling at farm gate.

The average monthly income negatively impacted the choice of farm gate outlet (Table 2). A single US dollar increase in average monthly income decreased the chances of choosing farm gate outlet by 0.03%. The finding implies that higher incomes decreased the likelihood of the farmers selling at farm gate. On contrary, the average monthly income positively impacted the choice of local market

TABLE 2. Multivariate probit results on transaction cost factors influencing choice of marketing outlets

Variables	Farm gate		Local market		Export market	
	$\beta$	RSE	$\beta$	RSE	$\beta$	RSE
Gender of household head	.791***	.422	.23	.349	-.102	.339
Household size	.018	.068	.096	.067	-.131**	.055
Age in years of respondents	-.036	.026	-.020	.0178	.011	.016
Farm size (hectares)	.064	.123	-.101	.142	-.119	.141
Time taken to reach other outlets (Min)	-.014**	.007	.005	.010	.001	.008
Log yield loss via spoilage (M kg <sup>-1</sup> )	3.88	12.4	17.6	16.2	-.870	15.02
Sorting and grading costs (M)	.0004	.001	-.006*	.002	.001	.001
Average Monthly income (M)	-.0003*	.0001	.0002***	.0001	.00001	.0001
Communication Costs (M)	.005*	.002	-.010*	.002	-.0004	.002
Negotiating (hours)	-.039	.067	-.036	.048	-.025	.029
Contractual arrangement fees (M)	.004	.004	.003	.006	.001	.004
Constant	-3.63	12.5	-17.13	16.4	2.48	15.2
Number of observations					90	
Log likelihood					-91.03	
Wald $\chi^2(30)$					110.75	
Prob> $\chi^2$					0.0000***	
Likelihood ratio test of					$p_{21} = p_{31} = p_{32} = 0$	

Note: Variable marked with \*are significant at 10%, \*\* at 5%, \*\*\*at 1%, 1USD=14 LS

Costs of marketing outlets among smallholder farmers

outlet. *Ceteris paribus*, an additional dollar increase in average monthly income increased the likelihood of selling in local market outlets by 0.02%. These findings suggest that higher incomes increased the likelihood of selling to local markets due to capacity to pay for transportation costs, owning other marketing assets such as mobile phones for accessing market information (Okello, 2019).

The cost of sorting and grading peaches had a significant ( $P < 0.1$ ) negative effect on the choice of local market outlet only (Table 2). One-dollar increase in the cost of sorting and grading resulted in reduced chances of selling in local markets by 0.6%. This suggests that the higher the sorting and/or grading costs of peaches incurred, the less likely the farmers chose to sell their produce in the local market. The implication is that sorting and grading costs are of less importance in influencing farmer's decision to choose a local market outlet as the costs would easily be transferred to the buyers (Fafchamps and Hill, 2005). This is probably because there was a slight diminutive difference between local market outlets and farm gates, especially to those farms situated along the roads, hence, an indication that the local market was just as informal as farm gate. High transaction costs, sorting and/or grading costs in this case, associated with any outlet normally restricts market penetration among smallholder farmers. Farmers who supposedly had expertise in sorting and grading usually preferred selling their produce in the high value markets such as export market, in order to cover costs associated with acquiring the expertise (Jari and Fraser, 2009).

Communication costs were found to positively influence the choice of farm gate at ( $P < 0.1$ ) (Table 2). *Ceteris paribus*, one-dollar increase in the cost of communication increased the likelihood of choosing farm gate by 0.5%. This implies that high communication costs increase the likelihood of selling peaches at farm gate due low infrastructure in most of rural settings of Lesotho, which in turn

favours face-to-face interactions for effective communication.

Table 2 shows that communication costs negatively influenced the choice of local market outlets. *Ceteris paribus*, one-dollar increase in the cost of communication decreased the likelihood of choosing local market outlet by 1%. The implication from the findings is that farmers who incurred higher communication costs were less likely to sell in local market. This is because farmers who sold at farm gate normally knew potential buyers who were possibly contacted during the time of peach sale.

Hamilton *et al.* (2013) noted that the cost incurred on advertisement, communication in this case, could increase the sales rate thus reducing the loss that can accrue to spoilage of the produce. Our finding is in line with Melese *et al.* (2018), who reported that communication is used to access information and knowledge which strengthen production and marketing. On the contrary, the negative effect between communication costs and local market outlet choice could be due to proximity of a farm to the market, which is also within vicinity of the buyers and eases communication through word of mouth between farmers and buyers thereby increasing peach sale at relatively low advertisement costs. Information spreading by word of mouth is equally important in the flow of information (Lancaster and Torres, 2019).

## CONCLUSION

The study reveals that choice of farm gate market outlet is positively influenced by gender of the respondents and communication; while time taken to reach other outlets and average monthly income costs negatively influenced farmers' decision with regard to choice of farm gate outlet. Three variables; sorting and grading costs, average monthly income and communication costs determined local market outlet decision; while household size

influenced farmers' export market negatively. Improving roads and communication infrastructure could enhance marketing of peaches at all outlets. Access to market information regarding both distance and time taken to reach each of the outlets can help in reducing transaction costs as farmers would be making more informed decisions regarding sale of their products.

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