

A DOUBLE HURDLE ANALYSIS OF CONSUMERS' DECISIONS TO PURCHASE AFRICAN LEAFY VEGETABLES IN LIMPOPO PROVINCE

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ABSTRACT

This study examines the factors affecting consumers' decisions to purchase African leafy vegetables (ALVs) in the Limpopo province. The double-hurdle model was used because it accounts for whether or not consumers purchase ALVs and how much they spend on these vegetables. Purchasing and expenditure decisions were analysed, using cross-sectional data collected from 299 households during 2012. The results showed that perception factors (such as nutrition) and socio-economic factors (such as gender, education, marriage and urbanisation) influence only purchasing decisions, while age and distance to the market influence only the level of expenditure on ALVs. Factors that influence both the purchasing decision and the level of expenditure are socio-economic factors (dependency on social grants) and perception factors (perception that ALVs are relish, tasty and affordable). Interventions by retailers such as sorting, packaging and canning will promote the value of ALVs, reduce preparation time before consumption and encourage young, male, urban and educated consumers to purchase ALVs. Furthermore, by integrating awareness programmes with the media (such as local and national radio and television stations, and social media) using languages the viewers and listeners understand, might more effectively promote the consumption of ALVs.

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BACKGROUND

The World Health Organization (WHO) recommends the consumption of more than 400g of fruit and vegetables per person per day to reduce the chances of malnutrition (WHO, 2003). This recommended intake is approximately double the amount of fruit and vegetables consumed by the average South African (Ronquest-Ross et al., 2015; Backeberg, 2014; Rose et al., 2002). Smith and Eyzaguirre (2007) stated that African leafy vegetables (ALVs) can play a crucial role in the WHO's global initiative to increase the consumption of leafy vegetables in sub-Saharan Africa. In this study, ALVs are defined as cultivated leafy vegetables native to a particular region, or having been introduced a long time ago and started to evolve through natural processes (Jansen van Rensburg et al., 2007).

In South Africa, ALVs are part of the day-to-day staple diet of many households, particularly in rural areas, and offer a rich source of iron, vitamin A and other nutrients. Although some ALVs are cultivated, most of them are non-cultivated. However, awareness about these vegetables is still poor and perceived by many South Africans as "food for the poor" (Venter et al., 2007). In terms of nutritional value, ALVs are perceived to be as good as or even better than conventional vegetables (Taruvinga & Nengovhela, 2015). During periods of food shortages, one of the coping strategies that consumers can apply is the use of ALVs. Almekinders and De Boef (2000) argued that the revival of communities' utilisation of ALVs might ensure conservation thereof. Moreover, the consumption of ALVs can significantly contribute to dietary requirements in terms of human health and food security (Zoro et al., 2014).

Despite reports that ALVs contribute to health, food security and nutrition at household level in South Africa, research by Nesamvuni et al. (2001), Mbhenyane et al. (2005) and Faber et al. (2007) reported that the production and consumption of these vegetables had declined over time. This decline was influenced by negative attitudes toward ALVs, constraining efforts that focused on enhancing their consumption (Matenge et al., 2012). Negative attitudes likely stem from certain crops being

considered weeds (Vorster & Van Rensburg, 2005), poor handling, unhygienic display at retail outlets (Amaza, 2009), and contradictory information about production sources (Yadav & Sehgal, 2004). This negative reaction is especially true among the youth and modernised members of the community. Yet, many rural people are unable to afford exotic leafy vegetables, as they are somewhat expensive by comparison with ALVs.

Many ALVs are high in nutritional content by comparison with exotic leafy vegetables (Keatinge et al., 2011). They are also rich in nutrients and represent the basis for diets in rural areas (Rudebjer et al., 2011). Studies such as De Benoist et al. (2008) recorded how ALVs could be used as a strategic ally to prevent food and nutritional insecurity. According to Ngigi et al. (2011), households in urban areas of Kenya care about the nutritional and safety attributes of ALVs.

In the case of ALVs, amaranth (*Amaranthus*) is a nutritious leafy vegetable in both its raw and cooked form. In addition, its nutritional value is higher in comparison with spinach and cabbage (Ebert et al., 2011). According to Lyimo et al. (2003), leaves of amaranth, pumpkins (*Cucurbita moschata*) and African nightshade (*Solanum scabrum* Mill.) contain higher levels of minerals and vitamins than exotic leafy vegetables. Msuya et al. (2009) and Uusiku et al. (2010) added that ALVs are rich in iron, zinc and β -carotene. It is also believed that spiderwisp (*Cleome gynandra*) leaves improve eyesight and provide energy (Van den Heever & Venter, 2007). Similarly, African lettuce (*Launaea taraxacifolia*) is locally believed (indigenous knowledge) to have lactogenic, aphrodisiac, antibiotic and anti-malaria properties, and has blood pressure regulating and haemorrhoid treatment capacity (Dansie et al., 2008). Wild mustard (*Brassica juncea*), like many other ALVs, provides essential vitamins, trace elements (iron and calcium) and other nutrients that are important for good health (Chweya & Eyzaguirre, 1999). The seeds also have high oil and protein content (Burton et al., 1999) although this is dependent on environmental conditions (Si & Walton, 2004). According to Mariga et al. (2012), collard (*Brassica oleracea*) and mustard (*Brassica*

juncea) greens are rich in proteins, vitamin C and iron. This study focussed mainly on mustard, collard greens and pumpkin (*Cucurbita moschata*) leaves. ALVs can potentially contribute to the alleviation of protein-energy malnutrition and micronutrient deficiencies.

Despite an abundance of literature on consumer behaviour, very few studies (e.g. Gido et al., 2017; Fungo et al., 2016) in Sub Saharan-Africa (SSA) had looked at both the decision to consume and the level or intensity. In addition, the few studies that had indeed investigated the determinants of SSA consumers' decision to purchase or consume relied on limited analytical approaches. For example, Fungo et al. (2016) relied on multinomial logistic regression analysis, whereas Gido et al. (2017) used a binomial regression model. The present study relied on the double-hurdle model, an econometric model that is popular in studies on the decision to consume (Aristei & Pieroni, 2008; Yen & Huang, 1996; Gao et al. 1995; Yen, 1993). This study distinguishes itself from other studies on the decision to purchase by using the double-hurdle model to determine factors influencing both the decision to purchase and the level of expenditure. To the author's knowledge, no study had yet examined the factors influencing the decision to purchase and level of expenditure in South Africa.

ALVs are cheap and thus affordable, and rich in the micronutrients that are lacking in imported vegetables and simplified urban diets, hence the importance of their nutritional value. However, their consumption shows a decrease. Awareness of ALVs is required to encourage the consumption thereof and reduce food insecurity and malnutrition in South Africa (Njume et al., 2014). The objective of this study was to determine factors affecting consumers' purchasing decisions and expenditure level of ALVs in the Limpopo province of South Africa. Understanding the factors that influence those decisions can inform policy decisions regarding required interventions to create and enhance value chains for the future of ALVs in Limpopo province. In addition, this study will highlight gaps in nutrition interventions, policies and programmes aimed at combating food and nutrition security.

FACTORS AFFECTING THE PURCHASING AND EXPENDITURE DECISION

The question of how socio-economic and perception factors influence consumer behaviour is important to all actors involved in the ALV value chain, as insights in consumers' purchasing decisions will inform the stakeholders and guide actions to enhance the role of ALVs. This section provides an overview of the socio-economic and perception factors affecting the demand for ALVs, drawing from the limited available literature.

Existing research has determined socio-economic factors that influence the consumption of ALVs. Only a few studies have examined the association between the gender of the household head and consumption patterns of ALVs. Women play an important role in the purchasing and consumption of ALVs as vegetable preparation is mostly considered as their job (Tumwet et al., 2014, Kimiywe et al., 2007). Regarding age, children (Kimiywe et al., 2007) and older people (Taruvinga & Nengovhela, 2015) are also consumers of ALVs. However, ALVs are not particularly consumed by the younger generation because of their unfamiliar tastes, or ignorance in preparing them (Orech et al., 2005). Education has a negative impact on the consumption of ALVs in the Eastern Cape of South Africa (Taruvinga & Nengovhela, 2015). In addition, a small proportion of urban households consume ALVs, and the level of income negatively influences the consumption of and purchasing behaviour in terms of ALVs. By comparison, lower income groups are the consumers of ALVs as opposed to groups with higher incomes (Kimiywe et al., 2007). Studies examining the relationship between awareness and consumption of ALVs are scarce. Raising peoples' interest is likely to spur them on into taking conscious and favourable action towards vegetable consumption. Agbelemoge (2014) confirmed this for ALVs by showing that consumer awareness/knowledge about ALVs has a positive impact on consumption.

Public perceptions of ALVs appear to be associated with knowledge about the product gained through research, as well as the extent to which it is consumed. Despite many people

being aware of the benefits of ALVs, the literature suggests that a large number of consumers hold mostly negative perceptions about these vegetables. Generally, the literature suggests that positive perceptions about ALVs are more prevalent among older and rural consumers, while negative perceptions are more common among younger and urban consumers (Vorster et al., 2007). According to Vorster et al. (2007), ALVs are tastier than other vegetables, and capable of boosting the human immune system, hence extending life expectancy. They also act as a digestive cleansing agent. Acheampong et al. (2012) recorded that the majority of consumers in Ghana purchased ALVs because they believed that they are more nutritious than conventional market vegetables and easier to prepare. Tumwet et al. (2014) and Kimiywe et al. (2007) also found that the reason for consumers purchasing ALVs is that they believe them to be nutritious.

METHODOLOGY

Study design, study area and sampling

A cross-sectional, quantitative study design was conducted in the Limpopo province of South Africa. This province is located in the far northern part of South Africa and is divided into five districts, namely: Vhembe, Mopani, Capricorn, Waterberg and Sekhukhuni. Data was collected in the Vhembe, Capricorn and Mopani districts. These districts were selected purposively based on their accessibility and relevance to the study. Data were collected in January 2012 from a sample of 300 consumers. One rural and one urban area were selected from each of the three districts. A meeting was held with the chief/leaders of these areas for permission to collect data, which was granted. Convenience sampling was used to identify households from both rural and urban areas, and the head of the household was interviewed. Data were collected by means of a structured questionnaire that was pretested and administered by trained enumerators who could speak the local languages, i.e. Sepedi (Capricorn district), TshiVenda (Vhembe district) and XiTsonga/Sepedi (Mopani District). Household heads were interviewed about their level of awareness regarding ALVs and their

perception towards ALVs. Only one questionnaire was excluded due to missing data, therefore 299 questionnaires were used for the analysis. Respondents were made aware that the ethical clearance had been granted to continue with the study.

Data collection

The data was collected between January and February 2012, using a pre-tested, structured questionnaire, which was administered by ten trained and experienced Agricultural Economics honours students from the University of Limpopo. The students were recruited and trained as enumerators by the principal researcher during a one-day training session. Apart from being able to speak the local languages, these enumerators had good knowledge of the rural development and farming systems. Training was meant to ensure the accuracy and reliability of the captured data. The enumerators were familiarised with the questionnaire to ensure that there was no interviewer bias. The questionnaire included two categories of information, namely socio-economic information and perception factors. Information on the socio-economic (interviewer-administered) section included age, gender, level of education, marital status, location, grocery purchaser, dependency on social grants, number of people eating ALVs in the household, awareness of ALVs, and distance to the ALV market. These questions were based on self-reporting and the answers were obtained at the beginning of the interview. The perception section (interviewer-administered) addressed the perception that ALVs are relish, tasty, easy to prepare, affordable, nutritious and medicinal.

The researcher used a questionnaire (Table 1) for all the respondents in relaxed settings using the language dominated in the specific district. That setting allowed the discussions to flow and elicit the respondents' personal socio-economic and perceptions on the topic. Each question was asked, and respondents engaged with the enumerator until they felt it had been exhausted.

Analytical model used in the study

Descriptive statistics by way of means and standard deviation were used to summarise the

TABLE 1: SOME SURVEY QUESTIONS USED IN THE QUESTIONNAIRE

Question	Responses
How many people eat ALVs in your households?	_____
Are you aware of any ALVs in your community?	Yes/no
How is the ALV market in kilometres?	_____ km
Of those vegetables you regularly purchase, why was the vegetable purchased? (Tick all that apply)	Relish
	Taste
	Easy to prepare
	Affordable
	Nutritious
	Medicinal

data. A double-hurdle model, proposed by Cragg (1971), was utilised to determine consumers' purchasing decisions and expenditure level in terms of ALVs, using the Software for Statistics and Data Science (STATA 15) software. The Tobit model might also have been considered as an option to address the issue, but this model is very restrictive. Both the Yes/No responses and continuous aspects are assumed to be explained by the same set of explanatory variables (Greene, 2008), an assumption which may not be true. The double-hurdle model relaxes this assumption (Yen, 1993).

Various studies conducted in the past on consumption and food expenditure revealed that the double-hurdle model is a better option by comparison with the Tobit model (e.g. Cragg, 1971; Keelan et al., 2009). It is assumed that consumers make two decisions regarding the purchase of ALVs. Firstly, a Probit model is used to determine whether consumers decide to purchase ALVs or not. The second stage decision for those who decide to purchase is to determine how much to spend on ALVs. The model permits separate stochastic processes for the Yes/No variable and for continuous decisions explained by different sets of explanatory variables. The model can be defined as:

$$\begin{aligned}
 y_{i1}^* &= w_i' \alpha + v_i && \text{Decision to purchase} \\
 y_{i2}^* &= x_i' \beta + \mu_i && \text{Expenditure decision} \\
 y_i &= x_i' \beta + \mu_i && \text{If } y_{i1}^* > 0 \text{ and } y_{i2}^* > 0 \\
 &= 0 && \text{Otherwise}
 \end{aligned}$$

where y_{i1}^* is a latent variable explaining consumers' dichotomous decision whether or not to purchase ALVs; y_{i2}^* is a latent variable explaining household consumption of ALVs; w_i' is a vector of variables explaining purchasing (Yes/No) decision; while x_i' is a vector of factors explaining the expenditure decision; and v_i and μ_i are the error terms assumed to be independent and distributed as $v_i \sim N(0,1)$ and $\mu_i \sim N(0, \sigma^2)$. Table 2 shows the description of the variables used in both the purchasing decision model and the level of expenditure model.

RESULTS AND DISCUSSION

A check for the possible presence of multicollinearity of all the variables in the estimated models was conducted by means of a variance inflation factor (VIF). The results presented in Table 3 shows that the highest value is 2.86, implying that multicollinearity is not a concern in the estimated models.

Descriptive statistics analysis

Sample statistics of the independent variables used in the analysis showed that 73% ($N=218$) of the respondents purchased ALVs, when they are in season, at an average expenditure of R17.02 per week.

Table 4 shows the descriptive statistics of socio-economic and perception factors of the sampled households. In the sample, the average household head was approximately 44 years

TABLE 2: DEFINITION OF VARIABLES INCLUDED IN THE ANALYSIS OF BOTH MODELS, LIMPOPO PROVINCE, 2012

Variable	Description of variables	Purchasing decision model	Expenditure level model	Unit
AGE	Age of the household head	x	x	Years
AGE ²	Age squared	x	x	Years
GEND	1 if the household head is female, 0 otherwise	x	x	Dummy
EDUC	Number of years household head spent in school	x	x	Years
MARR	1 if the household is married, 0 otherwise	x	x	Dummy
WOG	1 if the woman often does grocery shopping, 0 otherwise	x	x	Dummy
SOCG	1 if the household depends on social grants, 0 otherwise	x	x	Dummy
URBA	1 if the household is located in the urban area, 0 otherwise	x	x	Dummy
NEAT	Number of people in the family eating ALVs		x	Number
AWAR	1 if the respondent is aware of ALVs, 0 otherwise	x	x	Dummy
DIST	Distance to where ALVs are sold/bought		x	Kilometres
RELI	1 if ALVs are perceived by the household to be served as relish, 0 otherwise	x	x	Dummy
TAST	1 if ALVs are perceived by the household to be tasty, 0 otherwise	x	x	Dummy
EASP	1 if ALVs are perceived by the household to be easy to prepare, 0 otherwise	x	x	Dummy
AFOD	1 if ALVs are perceived by the household to be affordable, 0 otherwise	x	x	Dummy
NUTR	1 if ALVs are perceived by the household to be nutritious, 0 otherwise	x	x	Dummy
MEDI	1 if ALVs are perceived by the household to be medicinal, 0 otherwise	x	x	Dummy

Note: ¹ R1 = \$US0.118 (2012)

TABLE 3: VARIANCE INFLATION FACTOR (VIF) FOR VARIABLES IN THE MODELS

Variable	VIF
TAST	2.86
EASP	2.78
AFOD	2.27
NUTR	1.90
RELI	1.60
URBA	1.53
AGE	1.47
EDUC	1.41
MEDI	1.27
DIST	1.27
NEAT	1.17
WOG	1.11
MARR	1.09
AWAR	1.07
GEND	1.07
SOCG	1.07
Mean VIF	1.56

Source: Survey 2012

See Table 2 for meaning of abbreviated variables.

TABLE 4: SOCIO-ECONOMIC AND PERCEPTION CHARACTERISTICS OF THE SAMPLED HOUSEHOLDS, LIMPOPO PROVINCE, 2012

Variable	Purchasers of ALVs (N=218)		Non-purchasers of ALVs (N=81)		All (N=299)	
	Percentage	Standard Deviation	Percentage	Standard Deviation	Percentage	Standard Deviation
AGE*	44.53	14.853	41.18	16.222	43.65	15.269
AGE ² *	2211.20	1400.99	1930.44	1501.84	2136.40	1431.32
GEND	43	0.496	38	0.489	42	0.494
EDUC*	10.14	4.711	10.40	5.634	10.21	4.973
MARR	39	0.490	56	0.500	44	0.497
WOG	60	0.492	59	0.494	60	0.492
SOCG	13	0.335	21	0.410	15	0.358
URBA	40	0.492	65	0.479	47	0.500
NEAT*	3.60	1.437	00	0.000	3.35	1.562
AWAR	98	0.135	90	0.300	96	0.197
DIST*	6.41	8.560	00	0.000	6.47	8.524
RELI	79	0.409	07	0.264	60	0.492
TAST	44	0.498	05	0.218	33	0.473
EASP	52	0.501	04	0.190	39	0.488
AFOD	50	0.501	07	0.264	39	0.488
NUTR	69	0.464	14	0.345	54	0.499
MEDI	15	0.360	01	0.111	11	0.318

* denotes the means; Source: See Table 3

See Table 2 for meaning of abbreviated variables.

ALVs = African leafy vegetables

old. About 42% of the household heads were males, 47% resided in urban areas, and the average school education was 10 years. On average 44% of the respondents were married and household grocery shopping was mostly done by women (59%). Approximately 15% of the households depended on social grants as their main source of income. Most of the respondents (96%) were aware of ALVs and travelled an average of 6.5 km to buy them from the market. The descriptive results revealed that more than 50% of the respondents consumed ALVs as relish and believed that ALVs are nutritious, while less than 50% of the respondents believed that ALVs are tasty, easy to prepare, affordable and of medicinal value.

Factors affecting sample households' purchasing of and expenditure decisions regarding ALVs in the Limpopo Province

Table 5 shows the maximum likelihood estimates of the double-hurdle model in terms of the decision to purchase ALVs, as well as the relevant expenditure level. The value of the

Pseudo R² (55%), the log-likelihood (-719.978), and the LR Chi² (significant at the 1% level) indicate that the specifications of the two models provided a good fit to the data. In addition, the explanatory variables used in the models collectively explain consumers' decision to purchase ALVs, as well as the expenditure level in the study area. The results show that ten factors influenced the purchasing decision, while eight influence the level of ALV expenditure. Factors that only influenced the purchasing decision but not the level of expenditure were socio-economic characteristics (GEND, EDUC, MARR and URBA) and perception factors (NUTR). Moreover, factors that only influenced the level of expenditure but not the purchasing decision were AGE and DIST. Factors that influenced both the purchasing decision and the level of expenditure were the socio-economic factor (SOCG) and perception factors (RELI, TAST and AFOD).

The age variable (AGE) only affected the level of expenditure on ALVs but did not have any influence on the decision on whether or not to

TABLE 5: PARAMETER ESTIMATES OF THE DOUBLE-HURDLE MODEL FOR AFRICAN LEAFY VEGETABLES (ALVs) EXPENDITURE IN LIMPOPO PROVINCE, 2012

Variables	Purchasing decision		Expenditure decision	
	Coef.	Std. Err.	Coef.	Std. Err.
AGE	0.087	0.040	-0.012**	0.437
AGE ²	-0.001	0.000	0.002*	0.005
GEND	-0.163***	0.235	0.318	2.313
EDUC	-0.013***	0.028	-0.282	0.283
MARR	-0.153**	0.247	0.117	2.342
WOG	0.014	0.240	0.560	2.333
SOCG	-0.219**	0.290	-0.383**	3.343
URBA	-0.735***	0.267	-2.276	2.757
NEAT	-	-	1.135	0.821
AWAR	0.831*	0.659	13.571*	8.404
DIST	-	-	-0.266*	0.165
RELI	1.994**	0.301	5.579*	3.398
TAST	0.335**	0.409	6.642*	3.731
EASP	0.522	0.386	0.751	3.576
AFOD	0.028***	0.388	9.474**	3.481
NUTR	0.955***	0.295	3.651	3.224
MEDI	-0.196	0.560	2.301	3.414
Cons	-3.419	1.220	36.665	14.994
Sigma	-	-	12.371	1.020
Prob > chi ²	0.000***			
Log-Likelihood	-719.978			
Wald chi ² (15)	35.46			
Pseudo R ²	0.55			

Notes: ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. See Table 2 for meaning of abbreviated variables; Source: See Table 3.

purchase ALVs. The results imply that younger respondents were less likely to spend more on ALVs in comparison with older ones. Older people had local knowledge of ALVs having nutritional and health benefits (Oniang'o et al., 2004). Jansen van Rensburg et al. (2007) also noted that young people in South Africa had hardly consumed ALVs because they did not want to be described as old fashioned and poor. In this respect, only middle-aged and older people participated in the consumption of ALVs (Mayekiso, 2017). Regarding the gender variable (GEND), the decision to purchase ALVs was negatively significant. This implies that households headed by females were more likely to purchase ALVs in comparison with their male counterparts. Hart and Vorster (2006) also confirmed that ALVs were regarded as a food mainly consumed by females. The dummy variable, marital status (MARR), affected the decision to purchase ALVs significantly negative, but not that of the level of expenditure.

This implies that married people were less likely to purchase ALVs and less likely to spend more on ALVs. The reason may be that men, who happened to be the husbands, were less likely to consume ALVs, therefore, there was no reason for married women to purchase and prepare ALV dishes.

Meanwhile, the respondents' level of education (EDUC) affected the purchasing decision negatively, but not the level of expenditure. This implies that families headed by relatively educated people were less likely to purchase ALVs, thus, higher education levels reduced the acceptance of ALVs as a food choice. These results concur with Tarvinga and Nengovhela (2015) who reported that education had a negative impact on the consumption of ALVs in the Eastern Cape. This may be attributed to the fact that not much information regarding ALVs' health and nutrition benefits had been made available and accessible to the consumers in

general (Smith & Eyzaguirre, 2007).

The variable, dependency on social grants (SCG), was associated with a decreasing probability of both the decision to purchase ALVs and the level of expenditure. In other words, households who depended more on social grants were less likely to purchase ALVs and also less likely to spend more on these foods. One reason may be that the grant received is mainly spent on staple foods rather than on ALVs, as the grants may be inadequate to cover both, while another may reason may be that some ALVs can be freely harvested from the wild. Although the main purpose of the social grants programme is to help the poor meet their basic needs, some beneficiaries such as young mothers had been reported to use the money on items such as luxury foods, clothes and gambling (Nkuna, 2008), rather than on affordable nutritious indigenous goods. They do this so as not be perceived and classified as poor by their friends and neighbours.

Regarding the urban variable (URBA), the results show that urban consumers were less likely to purchase ALVs in comparison with rural respondents. The results show that urbanisation played a significant role in determining the likelihood of purchasing ALVs. Local knowledge of ALVs is likely higher in rural areas in comparison with urban areas. The rates of malnutrition among urban children were increasing faster than urbanisation itself and more than half of these children were malnourished (FAO, 2012). Awareness about the nutritional content of ALVs, access to urban markets and increasing production could benefit farmers as well as nutritional security among urban low-income households. The consumption of ALVs by urban households ought to increase by promoting value-added activities such as arranging/sorting, packaging, and canning of the product before marketing. In both rural and urban areas, integration of ALV products into the diverse food systems may encourage non-purchasers to buy and consume ALVs.

The significant effect of household awareness (AWAR) on both the decision to purchase ALVs and the expenditure level were positive. These results suggest that respondents were more likely to purchase ALVs and spend more when

they were aware of the nutritional and cultural values of ALVs. These results concur with Agbelemoge (2014) in that consumer awareness/knowledge about ALVs had a positive impact on the consumption of ALVs. Interventions that would promote the transfer of information regarding ALVs to male and younger decision-makers may increase the likelihood to purchase and consume ALVs. Distance to ALV markets (DIST) determined consumer ease of accessing these products. In this study, this variable significantly and negatively influenced the level of households' ALV expenditure. These findings further reinforce the notion that ALV consumption moved more towards being market driven, suggesting that consumers were likely to consider ALV consumption if markets selling them were closer. Longer distances to markets constrained access to food commodities due to high transportation costs (Vorster et al., 2007).

The relish variable (RELI) significantly affected both the purchasing decision and the level of expenditure positively. This implies that the relish attribute increases the probability of purchasing ALVs and the level of expenditure. According to Vorster et al. (2002), the tender leaves and flowers of ALVs are normally boiled and consumed as a relish throughout sub-Saharan Africa. The cooked ALVs are then enjoyed with a stiff porridge. This is a nourishing dish for many poor households who cannot often afford meat. Respondents' perception that ALVs were tasty (TAST) positively and significantly affected both the decision to purchase and the level of expenditure. The results concur with those of Vorster et al. (2007) that the taste of ALVs increased the probability of the purchase decision. Taruvunga and Nengovhela (2015) also found that households believed that ALVs were tasty and easy to cook, which made them a preferred daily dish in rural areas.

Consumers who thought that ALV prices were affordable (AFOD) were more likely to purchase and spend more on them. Price perception has several roles in the price-quality association, prestige sensitivity, price consciousness and value consciousness of consumers, but they may change over time based on how they influence consumers' purchasing behaviour (Sternquist et al., 2004; Fatih, 2014). Like other

agricultural products, market prices for ALVs fluctuate across seasons, making them less affordable among poor households, especially during dry seasons (Amaza, 2009). Consumers who are adequately informed about the importance of ALVs in a diet have a higher willingness to pay premium prices when purchasing these vegetables (Chelang'a et al., 2013).

The model results confirmed a significant positive association between the perception that ALVs are nutritious (NUTR) vegetables and the decision to purchase. This implies that consumers who perceived ALVs to be nutritious were more likely to purchase them. These findings, therefore, suggest that there may be sufficient evidence to claim that ALV production may be positively supported as long as rural households continue to share positive nutritional beliefs regarding these vegetables. In light of this finding, the observed association may be based on the assumption that production is driven by the desire to address nutritional deficiency. Tumwet et al. (2014), Acheampong et al. (2012) and Kimiywe et al. (2007) reported similar results.

CONCLUSIONS AND RECOMMENDATION

This study used a double-hurdle model to determine the impact of socio-economic and perception factors on consumers' decision whether or not to purchase ALVs, and their level of expenditure on these foods. ALVs were found to be more commonly purchased and consumed by women. Interventions to raise awareness about their health and nutrition benefits may help to promote the consumption and purchasing of ALVs by educated, male, urban dwellers. Generally, ALVs were rather accepted by rural than by urban respondents. Strategies are required to enhance value addition and sensitisation of consumers to traditional knowledge regarding ALVs, as well as their nutritional importance to the human diet. There is a need to develop the food supply chain from rural to urban in order to meet the needs of a rapidly urbanising population.

ALVs were found to be consumed more by those who were aware of their benefits, but less

consumed by the educated respondents. Hence, strategies offering awareness programmes to consumers who are unaware of ALVs and their benefits (such as the young, males and urban households) may increase the chances of consumption. Interestingly, the results showed that increasing levels of dependency on social grants was associated with decreasing level of expenditure on ALVs, suggesting that increasing income from social grants entrenches a culture of dependency and entitlement. The results of this study suggest that the influence of social grants on the purchasing decision and level of expenditure is not a question of whether or not a household is a social grant beneficiary but the level of household dependency on social grant income. In order to promote the consumption of ALVs in the Limpopo province, the study stresses the need to find strategies integrating awareness programmes on media (such as national and local radios, television stations, newspaper and social networks) where consumers are informed about the nutrition and health benefits of ALVs in languages they understand, may promote the consumption of ALVs by educated and urban consumers. Other strategies that could promote and increase urban households' ALV consumption include value-adding activities such as canning, cutting, and quality packaging. These presentations will require traders and retailers to become involved by stocking them. Consumers who buy these products will need less time to prepare the ALVs before cooking. This will encourage poor households to consume ALVs and not to see them as a poor man's food.

It is crucial to understand the changing perception factors of consumers that have an impact on their decision to purchase and expenditure level on ALVs. This understanding may assist policy makers to implement agricultural and food policies related to the ALV industry, thereby addressing the food security, nutrition and health nexus. Future breeding and value-adding activities to enhance taste is necessary to encourage the consumption of ALVs. All such initiatives will have another positive societal value of reducing dependence on a handful of crops for nutrition and food security. Furthermore, an increased consumption will contribute towards stabilising food commodity prices, as food product markets

will become more resilient as their product portfolio expands. The limitation of this study is that data from only one province in South Africa were analysed, which means that the data are not nationally representative. It is recommended that nationally representative studies be conducted to provide further understanding of ALV perceptions.

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