AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Retailing traditional African vegetables in Zambia

Justus Ochieng¹, Ramu Govindasamy^{2*}, Fekadu F Dinssa¹, Victor Afari-Sefa³
and James E Simon⁴

¹World Vegetable Center, Eastern and Southern Africa, Duluti, Arusha, Tanzania

²Department of Agricultural, Food and Resource Economics, Rutgers University, New Jersey, USA

³World Vegetable Center, West and Central Africa-Coastal and Humid Regions, IITA-Benin Campus,
Cotonou, Benin

¹World Vegetable Center Eastern and Southern Africa, Duluti, Arusha, Tanzania

⁴Department of Plant Biology, Rutgers, The State University of New Jersey, USA

*Corresponding author: govind@sebs.rutgers.edu

In sub-Saharan Africa, including Zambia, rising awareness of the nutrition and health benefits of traditional African vegetables (TAVs) has raised demand over the past decade. TAVs compete with conventional vegetables in most retail outlets such as supermarkets and small food stores. Yet, there is little information on the retail structure of organic traditional vegetables. This study sought to identify the trading structure of organic TAVs; the determinants of retailers' decision to sell these vegetables and the major bottlenecks to the growth of TAV retailing. Results indicated that it was the expected profits and consumer concerns over food safety that influence the retailers' decision to sell organic TAVs.

Keywords Organic, traditional African vegetables (TAVs), retailers, food safety, Zambia

JEL classification Q02, Q13

The Organic Trade Association (OTA) defines 'organic agriculture' as 'an ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity'. It is based on the minimal use of farm inputs and on management practices that restore, maintain, and enhance ecological harmony. The production of organic foods involves manual weeding and using natural predators or products to control insects and diseases instead of relying on chemical controls (Klonsky, Tourte, and Chaney 1993). Chemical residues in vegetables and fruits are hazardous to health. Producers unaware of the risk, or the appropriate use, of chemical pesticides and inorganic fertilizers may pass on the risk to consumers. Preferences and perceptions of food risks and public health hazards are changing worldwide (Govindasamy, DeCongelio, and Bhuyan 2006; Oberholtzer, Dimitri, and Jaenicke 2014). Consumers tend to avoid foods that have pesticide residues; contain genetically

modified organisms; or lack traceability, labelling, or packaging. They prefer organically produced foods that use environmentally sustainable farm practices over foods that use agrochemicals or synthetic inputs, and they are willing to pay a premium (Govindasamy, DeCongelio, and Bhuyan 2006; Oberholtzer, Dimitri, and Jaenicke 2014; Nandonde and Kuada 2016).

Food safety, health, and environmental concerns have made the production and consumption of organic commodities the priority of policymakers the world over (Sirieix, Kledal, and Sulitang 2011) and compelled retailers and farmers to respond to consumer demands for healthy products. The consumption of fresh organic vegetables is the best way to prevent human health hazards associated with the consumption of conventional foods in sub-Saharan Africa (Nouhoheflin et al. 2004). The overall market for organic produce is very small, however, because awareness is poor,

income levels are low, and there are no local organic standards or infrastructure for local market certification (Kalibwani 2004).

Malnutrition is a major burden on the Zambian health care system. Dietary diversity is still low because most households depend on carbohydrate-based diets with few consuming meat-based products and vegetables that provide the most required vitamins to meet daily nutrient requirements. Nationally, 40% of the children under five suffer from chronic malnutrition (stunting or low height-for-age) and 15% suffer from acute malnutrition (wasting or low weight-for-height) (CSO, MOH, and ICF 2014). Besides, about 47% of the women of reproductive age (15–49 years) and 60% of the children (6–59 months) suffer from anaemia (GOZ 2015).

Traditional African vegetables (TAVs) constitute a vitally important source of micronutrients, fibre, vitamins, and minerals; these complement staple foods and improve the nutritional quality of diets (Ochieng et al. 2017; Weller et al. 2015). Organically produced TAVs could provide farmers greater benefits, and most consumers prefer TAVs because of their nutritional benefits. Farmers who produce crops organically receive higher retail prices (Govindasamy, DeCongelio, and Bhuyan 2006). Organic products are perceived to be very expensive, though; often, they are bought only by the rich while the poor often buy conventionally produced local products (Sirieix, Kledal, and Sulitang 2011). Some studies argue that organic farming is often a lifestyle choice (Padel 2001), and that organic farmers are less profit-oriented than conventional farmers (Läpple 2013). Few retailers use organic labels for fruits and vegetables, whether fresh or processed. Organic farming and trade needs to be taken seriously in developing countries.

Demand for TAVs is increasing in Zambia, and organic farming could contribute to this growth (Nguni and Mwila 2007). Producer groups improve farmers' access to information and farm inputs, and forming producer groups for organic TAVs could realize more economic benefits (Ochieng et al. 2018). In response to the changing preferences of consumers in Africa, farmers formed the African Organic Network (Willer and Lernoud 2017). To promote organic agriculture in Zambia, the Organic Producers and Processors Associations of Zambia (OPPAZ), an umbrella association of organic producers and processors, was

formed in 1999. The association is affiliated to the Zambia National Farmers Union, which represents the interests of Zambian farmers at the national level. The OPPAZ is an accredited member of the International Federation of Organic Agriculture Movements (IFOAM).

In Zambia, 7,552 hectares of land is currently allocated to organic agriculture and 525 hectares to organic vegetable production (Willer and Lernoud 2017). In terms of the number of organic producers in Africa, Zambia ranks ninth after Ethiopia, Uganda, the Democratic Republic of the Congo, Kenya, Madagascar, Morocco, Namibia, South Africa, and Tanzania (Willer and Lernoud 2017). The demand for TAVs remains very low relative to the conventional produce (Sirieix, Kledal, and Sulitang 2011), but Zambia has made some progress in developing its own local organic standards (Willer and Lernoud 2017). Organic food sales have grown, influenced by several emerging shopping malls in Lusaka and Chipata, Manda Hill, Arcades, and Crossroad, with modern supermarket food retail outlets such as Shoprite dealing with the sale of diverse vegetable types (Miller, Nel, and Hampwaye 2008). The Zambian market for organic products has expanded rapidly over the past decade, particularly after realizing that organic producers unable to access export markets could sell their produce in the domestic market (OPPAZ 2006).

Despite this increased growth, retailers are still not stocking organic vegetables, particularly TAVs, because the supply of organic products is limited, their prices are high, the product appearance is poor, maintaining credibility and professionalism in the business is a challenge, and regulatory and marketing structures are absent (Nandi et al. 2017). A full range of activities is required to bring organic TAVs to the market, ranging from conception through the different phases of production, delivery to final customers, and final disposal after use (Figure 1).

Minerals, which are essential components of a balanced and healthy diet, are present in high concentrations in TAVs, and consuming TAVs has numerous nutritional benefits, but retailers procure or stock these in limited quantities. Modern supermarkets in major cities have fresh produce sections, much like supermarkets in Europe and North America, but these sections often omit TAVs (Lotter et al. 2014), because the urban elite considers TAVs as food for the poor and feel that one

Figure 1 Simplified organic vegetables value chain map in Zambia

should stop consuming TAVs when one ‘modernizes’ (Yang and Keding 2012). Food retailing in Zambia accounts for 90% of the sales in supermarkets such as Shoprite, but these supermarkets play only a minor role in marketing agricultural produce (World Bank 2009). In local markets, organically produced vegetables fetch the same price as inorganically produced ones; that may discourage small-scale farmers from producing organic TAVs. Secondly, powerful traders benefit more than farmers because they have the financial resources, the knowledge to develop new markets or participate more effectively in current markets, and the ability to communicate with people in different parts of the value chain (Kaplinsky and Morris 2001). Information on market demand is required to design marketing strategies for TAVs.

Studies on retailers’ procurement of organic products have been conducted mainly in Europe, the US, Australia, and China (Oberholtzer et al. 2014; Sirieix et al. 2011). The only recent study of modern food retail buying behaviour in sub-Saharan Africa was conducted in Tanzania (Nandonde and Kuada 2016). The results indicate that modern food retailers select local food suppliers based on their reliability, quality, acceptance of credit terms, and legal certification. Promotional activities—for example, in Kenya, Tanzania, and Uganda—have led to an increase in the demand for TAVs in urban supermarkets, groceries, retail markets and hotels and restaurants (Agong et al. 2013; Ochieng

et al. 2017). But the procurement behaviour of retail businesses cannot be generalized, because cultural and local contextual factors differ. Studies are needed, particularly in developing economies such as Zambia (Manjeshwar, Sternquist, and Good 2013), and for new and current information on the present structure of the retail market for organic TAVs.

In Zambia, urban food retailing is rising, but few studies have been conducted on the topic. Large retailers in Zambia often ensure continual supply by importing conventional vegetables, particularly from South Africa, but some consumers do not typically accept imports from other countries (Jaenicke, Dimitri, and Oberholtzer 2011), and retailers buy organic TAVs from OPPAZ members and non-members both. This study seeks to explore the bottlenecks to the growth of TAVs in Zambia, the determinants of retailers’ decisions to stock organic TAVs, and the factors retailers consider in engaging a supplier of TAVs. This study, based on a market analysis of TAVs in Zambia, will help in promoting consumption. The findings of this study will be used by policymakers, retailers, and growers to increase production and marketing of organic TAV and, in turn, improve nutrition and health.

Methodology

Study area and data collection

A baseline market survey of retailers was carried out to understand the trading of TAVs in Zambia. The survey was done in two regions: Lusaka and Chipata, in the Eastern province. Lusaka is the capital and largest city of Zambia, while Chipata is the business and administrative hub that serves the region and has retail stores that sell TAVs as well. In 2015, between 20 October and 6 November, data were collected by Rutgers University, USA and World Vegetable Center (WorldVeg) in collaboration with AgriSmart, a locally registered non-governmental organization (NGO) in Zambia.

The study population comprised retailers who are defined as a company or business that buys vegetables from wholesalers or farmers and sells them to end users or customers. The retailers considered in this study include supermarkets, brokers, or collectors and retail food stores selling vegetables to final consumers. All the stores that sold TAVs in addition to other types of

vegetables were surveyed. The effort was made to locate all stores that fit the above criteria for inclusion, and all the retailers who accepted to participate in the survey in Lusaka and Chipata were interviewed. After looking for all the retailers, 75 were interviewed (50 in Lusaka and 25 in Chipata). Of all the retailers, 43 were selling organic TAVs. More retailers were selling TAVs in Lusaka than in Chipata.

A structured questionnaire was used to elicit data. The survey instrument had the following sections: socio-economic characteristics of the trader, information about the shop, procurements and services, shop sales and services. It was administered to the owner of the retail business or the manager in English and also in the appropriate lingua franca of the provinces—Bemba and Nyanja in Lusaka and Tumbuka, Chewa, and Nsenga in Chipata. This helped to ensure that the questions were clear and correctly understood by both the interviewers and interviewees. The interviewers were trained on questionnaire handling and interview techniques to ensure that good quality data was obtained. Finally, the completeness and consistency of the questionnaire were monitored every day to ensure that all sections of the questionnaires had been answered appropriately.

Empirical methods

The logit model was used to estimate the factors that influence retailers' decision to stock organic vegetables for sale—a dichotomous response variable, where a retailer either opts to buy or not. The selected model is an appropriate tool in situations where there is a dichotomous output that is thought to be influenced by independent variables. The model assumes that retailers have to choose between two alternatives; the log of the odds ratio of making a choice is a linear function of the retailers' attributes; and retailers maximize their expected utility by selecting the type of TAVs to retail. The organic food market growth in Zambia has grown over the past decade (Willer and Lernoud 2017), but the total share of organic food is still small compared with the total food market (Stolz et al. 2011). Food stores have an option of retailing organic TAVs or conventionally grown TAVs. The expected utility δ_i , from retailing organic TAVs, i can be represented by a latent variable:

$$y_i^* = X_i\beta + \mu_i \quad \dots(1)$$

The preferences, y_i^* for the retailer is not known, and X represents the characteristics that are observed and collected during the field survey in Lusaka and Chipata. The stochastic components are represented by β and parameter estimates by β . However, the decision to stock organic TAVs (y_i) such that $y_i = 1$, if the retailer sells organic TAVs and $y_i = 0$, if otherwise. Given that a retailer is expected to act rationally, he or she will choose to sell organic TAVs if y_i^* exceeds a threshold level, say 0 such that:

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* \leq 0 \end{cases} \quad \dots(2)$$

Assuming a random variable Y_i that indicates the observed choice of the type of traditional vegetables to sell, the corresponding logit model specification is as in Equation 3:

$$P_i(y_i = 1) = F(Z_i) = F(\alpha + X_i\beta) = \frac{1}{1 + \exp(-Z_i)} \quad \dots(3)$$

where $F(Z_i)$ is the standard logistic distribution function associated with each possible value of the underlying index Z_i and parameter β is to be estimated using maximum likelihood estimator. The logit equation thus becomes:

$$Z_i = \log\left(\frac{P_i}{1 - P_i}\right) = \beta_0 + \beta_i\chi_i + v_i \quad \dots(4)$$

where is the unobserved index or the log odds of choice for the i th observation, χ_i = independent variables, β_0 , β_i = parameters to be estimated and v_i = disturbance or error term. The dependent variable Z_i shows the probability that a particular retailer chose to retail organic TAVs or not. The parameter estimates do not directly represent the effect of the independent variables; therefore, the average marginal effects were estimated to estimate the effect of explanatory variables on the probability of retailing organic TAVs.

Based on the literature, the model includes dependent and independent variables: age and gender of the retailer; type of retail business if the retailer is concerned about food safety; experience in selling TAV; years spent in the vegetable business; and whether the business makes a profit (Table 1). Retailers with more years of vegetable or TAV retailing experience will have greater and repeated contacts with customers, which may enhance mutual trust and allow trading opportunities to be undertaken at lower costs

Table 1 Characteristics of the retail businesses

Variable	Variable definition	Mean	Standard	Minimum	Maximum
				deviation	
Age of the retailer or manager	Age in years	45.523	12.870	19	73
Gender of the retailer or manager	1 if male, 0 if female)	0.373	0.429	0	1
Type of shop	1 if wholesale and retail, 0 if retail	0.240	0.430	0	1
Food safety concerns	1 if the retailer or manager is concerned about food safety, 0 if otherwise	0.893	0.311	0	1
Experience in TAV retailing	Experience in selling TAVs in years	12.760	8.878	1	43
Years of operating business	Years the business has been in operation	11.027	9.127	0	43
Whether business gets profit	1 if business makes profit, 0 if otherwise	0.760	0.430	0	1
Number of observations (<i>N</i>)	75				

(Oberholtzer, Dimitri, and Jaenicke 2014). Since retailers are also consumers, some variables have been borrowed from consumer studies that show that well-educated consumers concerned about their health, food quality, and safety often demand organic products (Govindasamy, DeCongelio, and Bhuyan 2006).

Education facilitates the acquisition of skills that enable a trader to run a retail business successfully. Better educated retailers are expected to understand the nutrition and health benefits of organic TAVs and decide to stock them; retailers concerned about food safety are expected to be more likely to stock organic vegetables for sale (Stolz et al. 2011; Govindasamy, DeCongelio, and Bhuyan 2006). A profitable retail business is more likely to expand and sell organic TAVs. The retailer's gender variable is included because it influences the access to financial resources for the business. The model was tested for prediction accuracy or success and multicollinearity (see Table 4); it accurately predicts 78.6% of the dependent variable. The variance inflation factor (VIF) was used to check for a tolerance level of multicollinearity for all explanatory variables. The VIF for each variable ranged from 1.09 to 3.02. The mean (1.76) did not reach conventional thresholds of 10 or higher, implying that multicollinearity was not a problem.

Results and discussion

Retailers and their trading activities

The socio-economic characteristics of the retailers are presented in Table 1. Most retailers were selling to final

consumers, with about 24% of them selling to both final consumers and other retailers in the same area; 61% of the retailers were female, with an average of 13 years' experience in organic TAVs retailing; and about 89% were also concerned about food safety. About 28% of the retailers in the sample were retired; 76% reported making profits from their business; and more than 83% of the retailers stocked or handled both conventional vegetables and organic TAVs. The commonly traded TAV include amaranth (*Amaranthus hybridus* L.), okra (*Abelmoschus esculentus* L.), sweet potato leaves (*Ipomoea batatas* (L.) Lam.), African nightshade (*Solanum nigrum* L.), spider plant (*Cleome gynandra* L.), jute mallow (*Corchorus olitorius* L.) and kale (*Brassica carinata* (A) Braun) (50%–55%) (Table 2).

The retailers also stocked conventional vegetables and fruits such as tomato (*Solanum lycopersicum* L.), onion (*Allium cepa* L.), cabbage (*Brassica oleracea* L.) and watermelon (*Citrullus lanatus* Thunb). Others include eggplant (*Solanum melongena* L.), cucumber (*Cucumis sativus* L.), spinach (*Spinacia oleracea* L.), carrots (*Daucus carota*) and sweet pepper (*Capsicum annuum* L.) (Table 3). About 33% of the retailer's total vegetable sales were made up of TAVs (Table 3). Moreover, the retailers were asked to rank different vegetables based on consumer preference and monthly sales volume; amaranth was the most preferred traditional vegetable (83%), and larger volumes were sold compared to other vegetables, such as African nightshade (71%), okra (71%) and sweet potato leaves (68%) (Table 2).

Table 2 Traditional African vegetables sold by traders in Zambia and their relative importance in terms of perceived consumer preference

Vegetable	Stores selling (%)	Rank (%)				Volume sold (kg per month)
		Very important	Important	Indifferent	Not important	
Amaranth	70	82.5	8.8	7	1.8	562
African nightshade	57	71.4	21.4	0	7.1	1,139
Okra	79	71.4	4.8	9.5	14.3	409
Cowpea leaves	33	55.6	33.3	11.1	0	400
Kale	50	50	50	0	0	200
Spider plant	55	45.5	22.7	13.6	18.2	473
Jute mallow	50	0	100	0	0	40
Sweet potato leaves	64	67.3	13.5	11.5	7.7	530
Orange sweet potato leaves	50	0	50	0	50	14
Observations (<i>n</i>)	75					

Table 3 Volume of vegetables traded by retailers (in kg per month)

Type	Quantity purchased	Quantity sold
Conventional vegetables**	8,468	8,138
Cabbage	1906	1,839
Tomato	1,859	1,812
White beans	968	916
Onion	667	625
Watermelon	513	509
Others	2,555	2,437
Traditional African vegetables	4,322	3,987
Amaranth	650	562
Nightshade	1,248	1,139
Sweet potato leaves	763	750
Spider plant	515	473
Okra	454	409
Others	692	654
Total vegetable sold by retailers	12,790	12,125
Percentage of TAVs	34	33

**Top five vegetables are listed and the rest are combined in others

Factors that retailers consider when selecting TAVs suppliers

In engaging vegetable suppliers, retailers considered the reliability of vegetable suppliers; the freshness of the produce, which reflects the quality; and consumer

demand (Figure 2). The quality attributes considered by retailers are colour, size, gloss, texture, and uniformity. A similar criterion could be used to procure other food products. Previous studies, too, show that modern food retailers select local food suppliers based on their reliability and the quality of their food products (Neven and Reardon 2008; Nandonde and Kuada 2016), because smallholder growers are unable to produce and supply a sufficient volume of TAVs of the required quality at the right time to meet the market demand. The production systems of smallholder farmers are often not efficient, and their average cost of production is high, due to frequent product rejections, which prevent them from entering formal markets (Louw et al. 2008). Sensitizing farmers by helping them produce quality vegetables in adequate quantities and delivering them at the agreed time would improve their competitiveness and motivate retailers to procure vegetables from them.

In many developing countries, retailers cannot afford to invest in quality testing; therefore, their capacity to determine the quality of vegetables they procure is limited. Retailers also rely on consumer feedback to decide whether to buy more organic TAV from suppliers. Packaging is thought to indicate quality and is a very strong criterion for selecting suppliers (Nandonde and Kuada 2016), but this study does not find so, probably because retailers in Zambia often trade very low quantities (Table 2) and TAVs are not sold packaged.

Figure 2 Criteria used by retailers in Zambia to select suppliers of traditional African vegetables

Constraints faced by retailers

The most common challenges retailers face when procuring TAV (organic or non-organic) from local growers or suppliers are the difficulty in finding organic TAVs (87%); growers' inability to supply the desired quality vegetables (54%); their inability to reliably deliver the product required (53%); and the short shelf life of vegetables (52%) (Figure 3). Consistent with previous studies (Nandonde and Kuada 2016), this

study finds that the inability of farmers to supply quality vegetables in sufficient quantities constitutes the major constraint for retailers. Smallholder farmers do not produce enough and are often disorganized (Louw et al. 2008). One viable way of meeting the quantity demanded is by maximizing the benefits of collective marketing to access high-value markets such as supermarkets and even export markets (Ochieng et al. 2018).

Figure 3 Retailers' challenges in accessing traditional African vegetables in Zambia

Vegetables are perishable, and that makes marketing to retailers quite complex and risky. Ensuring that supply chains are short would reduce the transactions between farmer and consumer and reduce the losses to farmers (Hichaambwa and Tschirley 2010). Retailers can invest in preservation methods, although smaller retailers are likely to find the cost of preservation equipment (cold storage) prohibitive. Retailers also reported that smallholder TAV growers do not respond to requests in time, and they lose custom to competitors. Promoting urban agriculture in Lusaka, which is currently small (Hichaambwa and Tschirley 2010), will ensure a continual, year-round supply of vegetables to the growing urban population.

In Zambia, the market demand for high-quality organic TAVs is growing (Willer and Lernoud 2017). Most of the TAVs are grown in rainfed systems in rural or peri-urban areas of Lusaka and Chipata, where the poor road network tremendously affects the production and marketing of vegetables. Improving infrastructure and coordination would improve the supply chains (Hichaambwa and Tschirley 2010), ensure a consistent supply of organic TAVs and let food retailers meet the market demand instead of having to look for such produce to sell to specific customers.

Empirical results on the determinants of retailers' decision to sell organic TAVs

The selling of organic TAVs is significantly influenced by the retailer's experience and age, the ability of the

business to make a profit and consumer concern about food safety (Table 3). Business operators concerned about food safety relating to TAVs were more likely to sell organically produced TAVs, and retailers concerned about food safety were more likely to stock organic vegetables (Table 4). Food safety and health concerns influence consumer purchasing behaviour (Stolz et al. 2011; Govindasamy, DeCongelio, and Bhuyan 2006) and the retailer's decision to stock organic TAVs. Organic products are strongly believed to be safe and better for health and the environment (Sirieix, Kledal, and Sulitang 2011). Therefore, it is important for suppliers to obtain food safety certificates to access modern food retailing outlets (Digal 2015), although Zambian retailers have not yet started demanding safety certificates from organic TAV suppliers.

Experience reflects expertise in running a business, and it also enhances trust among suppliers and customers, but organic TAVs are highly perishable, and therefore risky and expensive to procure, and experienced retailers prefer to sell conventional produce. The experience of individuals or farmers negatively impacts their adoption of new, high-risk technologies or market opportunities (Nyanga 2012). Most of the older retailers had been selling conventional vegetables (Table 3) for a long time before incorporating TAVs into their business. In Zambia, the consumer demand for organic products is a recent trend, and retailers with long experience in retailing TAVs were less likely to sell organic vegetables than new retailers with little

Table 4 Factors influencing retailers to stock organic traditional African vegetables in Zambia

Variables	Coefficient	Standard error	<i>z</i>	<i>P>z</i>	Marginal effects (<i>dy/dx</i>)
Type of the retail business	-0.262	0.726	-0.360	0.718	-0.052
Food safety concerns	3.111	1.354	2.300	0.022	0.649
Experience in selling TAVs	-0.118	0.053	-2.230	0.026	-0.022
Age of the retailer or manager	0.088	0.037	2.340	0.019	0.017
Years of operating retail business	-0.016	0.042	-0.390	0.699	-0.003
Gender of the retailer or the manager	-0.108	0.737	-0.150	0.884	-0.021
Business makes profit	1.750	0.804	2.180	0.029	0.382
Constant	-5.242	2.495	-2.100	0.036	
Log likelihood =	-35.668				
Prediction accuracy =	75%				
Likelihood ratio (LR) chi-square test=	13.77				
Prob > chi ² =	0.005				

Notes Dependent variable: Sell organic TAVs (1=Yes and 0=Otherwise).

experience, who were more likely to respond quickly to consumer demands for organic produce they perceived to be safe. Older retailers were more likely than younger ones to sell TAVs, probably because they are used to consuming these pesticide-free vegetables since childhood and they know the benefits of consuming TAV.

Most studies characterize organic food consumers as affluent, well-educated, high-income earners concerned about their health and food quality and safety (Govindasamy, DeCongelio, and Bhuyan 2006); thus, retailers must respond to this market segment. Consumers who are well educated and have higher incomes often purchase vegetables in supermarkets and would access organic types if they are stocked. The retailers and farmers are likely to gain more from the market provided by Shoprite, the local supermarket, as its policy is to obtain at least 60% of the vegetables it sells from local sources (World Bank 2009). Retailers who reported to be making profits were more likely to sell TAVs than those who reported losses since they have enough cash flow to procure organic traditional vegetables that often fetch premium prices.

In Tanzania, the experience of food retailers is not important in deciding to procure goods from suppliers and, as in Zambia, the volumes of TAVs traded are usually small (Nandonde and Kuada 2016). In the US, the demand for these products began earlier, and retailers' decision to procure organic products is determined by the number of years a firm has been involved in the business (Oberholtzer, Dimitri, and Jaenicke 2014). It is important for retailers and consumers to understand the structure of organic TAV retailing and promote these over conventional ones for their nutritional and health benefits. This will allow food retailers to introduce store labels or own-brand organic TAVs that are known to be more nutritious, because consumer awareness and the market for TAVs will continue to increase in sub-Saharan Africa (Ochieng et al. 2017) and in the urban and peri-urban areas of Lusaka (Nguni and Mwila 2007).

Conclusions and policy recommendations

In Zambia, the size of the middle class as a proportion of the population has increased from 8.8% in 2008 to 14.4% in 2010 (AfDB 2011), and their awareness of

healthy eating habits has improved. Thus, to meet the growing demand for food, there has been a considerable rise of modern food retail stores in urban areas. The TAVs are marketed via domestic market outlets—such as supermarkets and small retail shops—where individuals, schools, and hotels can access them. The importance of organic TAVs to human nutrition and health is overwhelming, but retailers in Zambia trade low volumes. Only 33% of the retailers sell TAVs; the most commonly traded are amaranth and okra, which are sold by more than 70% of the retailers, followed by—in that order—African nightshade, spider plant, jute mallow, and kale. Overall, the selling of organic TAVs is significantly influenced by food safety concerns, the ability of the retail business to accrue optimal profits, and the age of the retailer or manager. Just like retailers of other produce, retailers selling TAVs face challenges related to the limited supply of organic produce and their short shelf life, and to identifying growers who can reliably and consistently supply vegetables at the desired volumes and time.

To operate efficiently and earn higher profits, retailers need well-coordinated supply chains. In turn, that requires streamlining procurement processes by establishing retailer–supplier relationships, encouraging retailers to invest in value addition, and providing them adequate cold storage facilities. Investing in market information systems and trading platforms would help in creating demand for organic vegetables in growing cities in sub-Saharan Africa. Providing consumers information on the benefits of consuming organic TAVs will help them understand the differences and similarities between organic and conventional vegetables and, in turn, help retailers increase sales. Encouraging retailers to engage in the TAV value chain, particularly in organic produce, would contribute significantly to the nutrition and health of urban and rural households.

Despite its contributions, this study has a few limitations. First, it did not survey suppliers or consumers; future studies on this topic should include them. Secondly, due to limitations of scope, it did not investigate branding, packaging, traceability, the usage of labelling, or the ability of consumers to distinguish between organic and non-organic TAVs. To guide the upgrading of the value chain of organic TAVs, future research should study these topics.

Acknowledgements

This research was supported by the Horticulture Innovation Lab with funding from the U.S. Agency for International Development (USAID EPA-A-00-09-00004), as part of the U.S. Government's global hunger and food security initiative, Feed the Future, for project titled "Improving nutrition with African indigenous vegetables" in eastern Africa. This study was made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the Horticulture Innovation Lab and do not necessarily reflect the views of USAID or the United States Government. We thank the New Jersey Agriculture Experiment Station (HATCH project 12131) and the World Vegetable Center. We also thank John Bowman, USAID Washington, D.C.

References

- African Development Bank (AfDB), Chief Economist Complex. 2011. The middle of the pyramid: dynamics of the middle class in Africa. *Market Brief*, 20 April. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/The%20Middle%20of%20the%20Pyramid_The%20Middle%20of%20the%20Pyramid.pdf
- Agong, S G, C O Ojiewo, G N Mwai, M O Abukutsa-Onyango, and R Nono-Womdim. 2013. Exploiting the genetic diversity of vegetable African nightshades. *Bioremediation, Biodiversity and Bioavailability* 7 (1): 6–13. doi:10.1002/10.115:8080/handle/123456789/194
- Central Statistical Office (CSO) [Zambia], Ministry of Health (MOH) [Zambia], and ICF International. 2014. Zambia Demographic and Health Survey 2013–14. dhsprogram.com/pubs/pdf/fr304/fr304.pdf
- Digal, L N. 2015. Modern retail food sector in the Philippines: Dominance of large domestic retailers and their effects on the supply chain. *The International Review of Retail, Distribution and Consumer Research* 25 (4): 407–30. doi:10.1080/09593969.2015.1023214
- Government of the Republic of Zambia (GOZ), Ministry of Health. 2015. *Zambia national malaria indicator survey 2015*. makingmalariahistory.org/wp-content/uploads/2017/06/Zambia-MIS2015_Jan20-nosigs.pdf
- Govindasamy, R, M DeCongelio, and S Bhuyan. 2006. An evaluation of consumer willingness to pay for organic produce in the northeastern US. *Journal of Food Products Marketing* 11 (4): 3–20. doi:10.1300/J038v11n04_02
- Hichaambwa, M and D Tschirley. 2010. How are vegetables marketed into Lusaka? the structure of Lusaka's fresh produce marketing system and implications for investment priorities. Policy Synthesis, Food Security Research Project, Ministry of Agriculture & Cooperatives, Agricultural Consultative Forum, Michigan State University–Lusaka Zambia. http://ageconsearch.umn.edu/bitstream/93008/2/ps_40.pdf
- Jaenicke, E C, C Dimitri, and L Oberholtzer. 2011. Retailer decisions about organic imports and organic private labels. *American Journal of Agricultural Economics* 93 (2): 597–603. doi:10.1093/ajae/aaq154
- Kalibwani, F 2004. Africa International Federation of Organic Agriculture Movements (IFOAM) Strategic Plan Draft (II) in Outcome of the African Planning Workshop held in Nairobi, Kenya.
- Kaplinsky, R and M Morris. 2001. *A handbook for value chain research*. Prepared for the International Development Research Centre (IDRC). fao.org/fileadmin/user_upload/fisheries/docs/Value_Chain_Handbook.pdf
- Klonsky, K, L Tourte, and D Chaney. 1993. *Production practices and sample costs for a diversified organic vegetable operation in the central coast*. University of California and the United States Department of Agriculture. core.ac.uk/reader/7001539
- Läpple, D. 2013. Comparing attitudes and characteristics of organic, former organic and conventional farmers: evidence from Ireland. *Renewable Agriculture and Food Systems* 28 (4): 329–37. doi:10.1017/S1742170512000294
- Lotter, D W, M J Marshall, S Weller, and A Mugisha. 2014. African indigenous and traditional vegetables in Tanzania: production, post-harvest management, and marketing. *African Crop Science Journal* 22 (3): 181–90. ajol.info/index.php/acsj/article/download/107167/97057
- Louw, A, D Jordaan, L Ndanga, and J F Kirsten. 2008. Alternative marketing options for small-scale farmers in the wake of changing agri-food supply chains in South Africa. *Agrekon: Agricultural Economics Research, Policy and Practice in Southern Africa* 47 (3): 287–308. doi:10.1080/03031853.2008.9523801
- Manjeshwar, S, B Sternquist, and L K Good. 2013. Decision making for retail buyers: perspective from India and China. *Qualitative Market Research* 16 (1): 38–52. doi:10.1108/13522751311289758
- Miller, D, E Nel, and G Hampwaye. 2008. Malls in Zambia: racialised retail expansion and South African foreign

- investors in Zambia. *African Sociological Review* 12 (1): 35–54. ajol.info/index.php/asr/article/viewFile/43528/27052
- Nandi, R, W Bokelmann, N V Gowdru, and G Dias. 2017. Factors influencing consumers' willingness to pay for organic fruits and vegetables: empirical evidence from a consumer survey in India. *Journal of Food Products Marketing* 23 (4): 430–51. doi:10.1080/10454446.2015.1048018
- Nandonde, F A and J E Kuada. 2016. Modern food retailing buying behaviour in Africa: The case of Tanzania. *British Food Journal* 118 (5): 1163–678. doi:10.1108/BFJ-09-2015-0335
- Neven, D and T Reardon. 2008. The rapid rise of Kenyan supermarkets: impacts on the fruit and vegetable supply system, in *The transformation of agri-food systems: globalization, supply chains and smallholder farmers*, (ed) E B McCullough, P L Pingali, and K G Stamoulis, 189–206. The Food and Agriculture Organization (FAO) of the United Nations (UN) and Earthscan Publications. fao.org/tempref/GI/Reserved/EPD-Group-FileExchange/COPUBLISHING/EARTHSCAN_Transformation%20of%20Agri-FoodSystems/ES_TAFS_print.pdf
- Nguni, D and D Mwila. 2007. Opportunities for increased production, utilization and income generation from African leafy vegetables in Zambia. *African Journal of Food, Agriculture, Nutrition and Development* 7 (4): 39–48. ajol.info/index.php/ajfand/article/view/136153
- Nouhoheflin, T, O Coulibaly, A J Cherry, R M Al-Hassan, and P Y Adegbola. 2004. Consumers' perception and willingness to pay for organic vegetable in Benin and Ghana. Paper presented at the Inaugural Symposium of the African Association of Agricultural Economists, Nairobi, Kenya, 6–8 December. [dx.doi.org/10.22004/ag.econ.9525](https://doi.org/10.22004/ag.econ.9525)
- Nyanga, P H. 2012. Factors influencing adoption and area under conservation agriculture: a mixed methods approach. *Sustainable Agriculture Research* 1 (2): 27–40. doi:10.5539/sar.v1n2p27
- Oberholtzer, L, C Dimitri, and E C Jaenicke. 2014. Examining US food retailers' decisions to procure local and organic produce from farmer direct-to-retail supply chains. *Journal of Food Products Marketing* 20 (4): 345–61. doi:10.1080/10454446.2013.807401
- Ochieng, J, B Knerr, G Owuor, and E Ouma. 2018. Strengthening collective action to improve marketing performance: Evidence from farmer groups in Central Africa. *Journal of Agricultural Education and Extension* 24 (2): 169–89. doi:10.1080/1389224X.2018.1432493
- Ochieng, J, V Afari-Sefa, D Karanja, S Rajendran, S Samali, and K Radegunda. 2017. How promoting consumption of traditional African vegetables affects household nutrition security in Tanzania. *Renewable Agriculture and Food Systems* 33 (2): 105–15. doi:10.1017/S1742170516000508
- Organic Producers and Processors Association of Zambia (OPPAZ). 2006. Development of the local market for organic products in Zambia. ifoam.bio/sites/default/files/page/files/developing_the_local_market_in_zambia_oppaz.pdf.
- Padel, S. 2001. Conversion to organic farming: a typical example of the diffusion of an innovation? *Sociologia Ruralis* 41 (1): 40–62. doi:10.1111/1467-9523.00169
- Sirieux, L, P R Kledal, and T Sulitang. 2011. Organic food consumers' trade offs between local or imported, conventional or organic products: A qualitative study in Shanghai. *International Journal of Consumer Studies* 35 (6): 670–78. doi:10.1111/j.1470-6431.2010.00960.x
- Stolz, H, M Stolze, U Hamm, M Janssen, and E Ruto. 2011. Consumer attitudes towards organic versus conventional food with specific quality attributes. *NJAS-Wageningen Journal of Life Sciences* 58 (3-4): 67–72. doi:10.1016/j.njas.2010.10.002
- Weller, S.C., E. Van Wyk and J.E. Simon. 2015. Sustainable production for more resilient food production systems: Case study of African Indigenous Vegetables in Eastern Africa. International Horticultural Congress, Brisbane, Australia. *Acta Horticulturae* 1102: 289-298.
- Willer, H and J Lernoud. 2017. *The world of organic agriculture 2017. Statistics and emerging trends 2017*. Research Institute of Organic Agriculture (FiBL) and International Federation of Organic Agriculture Movements (IFOAM)-Organic International. ifoam.bio/en/news/2017/02/09/world-organic-agriculture-2017
- World Bank. 2009. Zambia—commercial value chains in Zambian agriculture: do smallholders benefit? hdl.handle.net/10986/3075
- Yang, R and G B Keding. 2012. Nutritional contributions of important African indigenous vegetables. In *African indigenous vegetables in urban agriculture*, (ed) C M Shackleton, M W Pasquini, and A W Drescher, 105–44. London, UK: Earthscan. hdl.handle.net/10568/76872