

Market Barriers Faced by Formal and Informal Vendors of African Leafy Vegetables in Western Kenya

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Abstract

This research investigated market barriers faced by formal and informal vendors of traditional vegetables in Kenya, with the goal of closing market gaps and improving consumer access. The most common problem was access to capital, but informal vendors were more likely than formal vendors to perceive this as a major problem. Overall, 97% of vendors said that they had seen the vegetable market grow, which suggests that this market is still expanding. To improve urban nutritional security, the most important changes policymakers could enact are to increase access to capital and improve infrastructure to connect rural growers with urban consumers.

Keywords: market barriers, African leafy vegetables, formal markets, Western Kenya, nutritional security

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Introduction

Sub-Saharan Africa is home to the greatest concentration of food insecure people, where one quarter of the population is chronically hungry (FAO 2014). Malnutrition is even more common, as many people lack the essential vitamins and minerals needed to grow and lead healthy lives. This 'hidden hunger' can lead to stunting and blindness, impacting an estimated two billion people worldwide (WHO and FAO 2006). However, the fruits and vegetables that contain these critical micronutrients are often expensive and unattainable for the poor (Smith and Longvah 2008). Western Kenya is a prime example of the interconnected and complex issues of poverty, malnutrition, and low agricultural productivity (Conelly and Chaiken 2000) which has created many food insecure communities.

African Leafy Vegetables (ALVs) offer an innovative and locally appropriate way to address many of the food security challenges that face western Kenya. ALVs are a diverse set of vegetables that are consumed across Kenya as a mainstay of traditional diets (Muhanji et al. 2011). In many cases, however, introduced vegetables such as cabbage have received greater research investment into understanding barriers to production and marketing, compared to traditional vegetables (Adeka, Maundu and Imbumi 2009). ALVs are a nutritious and affordable source of micronutrients, providing vitamins A, B, and C, as well as minerals like calcium, iron, and zinc (Uusiku et al. 2010). They are adapted to the climate of western Kenya and are especially important to female smallholder farmers as they provide an important income-generating opportunity (Weinberger et al. 2011). In recent years the demand for ALVs, especially in urban centers, has outstripped the supply (Mwangi and Kimathi 2006) which creates new challenges and opportunities for urban vegetable vendors.

The formal market sector for fresh vegetables has been rapidly growing in recent years. Although well over 90% of consumers still purchase fresh vegetables from informal open air markets, the supermarket sector has been growing at 18% annually since 1995 (Neven et al. 2009). Participation in supermarket channels has significant financial implications for smallholder farmers. Growers participating in formal markets such as supermarkets increased their household income by 48% (Rao and Qaim 2011), as these growers receive 57% of the retail price as opposed to receiving 17% in informal market channels (Neven et al. 2009). Growers for supermarkets tend to own more land, have better access to transportation, and have off-farm income available as well (Rao and Qaim 2013). In addition, they were likely to hire more labor, and generally more female labor, although female workers were paid slightly less on average (Rao and Qaim 2013). There is still a much greater demand for ALVs in the informal urban market, but changing supply chains will impact both formal and informal vendors. Whether growers are producing for formal or informal markets, the growing demand in urban centers means that retailers and growers must seek new ways of ensuring that their products reach consumers.

Previous research has indicated that access to capital, inputs, and transportation have been major barriers to Kenyan smallholder farmers participating in formal markets (Neven et al. 2009). Less research has focused on the role of the vendor, but the informal relationship between the vendor and grower is critical to maintaining this supply chain (Bett, Ismail and Kavoi 2013). The barriers that prevent vendors from accessing ALVs or expanding their businesses are also

reducing ALV availability and accessibility for consumers. In areas where nutritional security is a widespread challenge, improving market supply chains has the potential to benefit growers, retailers and urban residents. Closing market gaps and modifying local policy has the potential to generate income for smallholder ALV growers and address unmet demand in cities across western Kenya.

The goal of this research was to understand the market barriers that both formal and informal ALV vendors face in the city of Eldoret, Kenya, which is Kenya's fifth largest city and a trading hub in western Kenya (with a population of 289,380) (Kenya National Bureau of Statistics 2009). Ultimately, improved nutritional security through ALVs can only be achieved when consumers and growers are better connected. Vendors provide this critical link, and the obstacles they encounter as intermediaries between growers and consumers should be reduced. This research will examine the prevalence of market barriers for formal and informal ALV vendors, as well as the differences between these two groups, with the goal of proposing solutions through policy recommendations.

Methods

Survey Design and Sample

The data presented here are based on surveys collected in the city of Eldoret, in Uasin Gishu County, Kenya. Surveys were collected between June and November 2015 from vendors who sold at least one variety of ALV. Eldoret was chosen based on its intermediate size and stage of supermarket expansion as documented by Neven and Reardon (2004). Eldoret currently has a large array of national and independent supermarkets offering fresh produce, while still maintaining a variety of open air markets.

Vendors who indicated they were willing to be surveyed were included in the sample and were stratified between formal and informal vendors. Informal vendors were randomly sampled using a random number generator and were interviewed in person at the markets where they sell vegetables. Supermarket vendors were interviewed at their workplace and were oversampled to obtain adequate data, since the number of supermarkets is still small. Vendors were surveyed on their ALV purchasing and sales behavior, postharvest handling, seasonal variation, and perceptions of market barriers using a structured questionnaire. Market barriers included infrastructure (specifically roads), municipal regulations, seasonal availability, price fluctuation, quality of produce, access to capital, consumer demand, and consumer perceptions of ALVs. Demographic information on vendor age, gender, income, and primary occupation was also collected. The surveys were validated through pre-testing.

In total, 158 informal vendors were surveyed and twelve formal vendors were surveyed, for a total of 170 vendors. Most vendors sold more than just ALVs, but were included if they sold at least one variety of ALV. Only supermarkets that had produce sections were included, and surveys were conducted at all of these locations. At larger supermarkets the produce manager was surveyed, and in smaller supermarkets the store owner was surveyed. Among informal vendors, there were multiple family members present at some informal market stalls, but usually only one adult was present. Thus, whoever self-identified as the proprietor was surveyed.

Informal market vendors were more likely to source directly from a variety of local farmers, while some of the major supermarkets sourced all of their produce from a single company in Nairobi, Kenya, approximately eight hours away by road. The biggest supermarket chains, Nakumatt and Tusky's, are both Kenyan-owned and each had two retail outlets in Eldoret with slightly different selections of fruits and vegetables. The majority of supermarkets sourced vegetables from closer farms, especially independently-owned grocery stores which had a single retail location and were generally family-owned.

Data Analysis

Data were analyzed for differences between informal and formal vendors for both market characteristics and perceptions of market barriers. Where appropriate, differences in the responses from formal and informal vendors were analyzed for significance at each level of barrier perception (not a problem, a small problem, or a big problem). Additionally, distance travelled in minutes to reach the market was modeled for both informal and formal vendors.

To evaluate differences between formal and informal markets, variables were divided into categorical and continuous variables. Continuous variables (age, income, species richness, distance travelled, bundle prices, and volumes sold) were subject to the non-parametric Mann-Whitney-Wilcoxon Sign Rank test, while categorical variables (all others) were analyzed by the Chi-Square Test of Independence. Differences in the perception of market barriers by formal and informal vendors were analyzed with a Fisher's Exact Test due to small sample size of formal vendors. This test calculates an exact p value and does not assume equal sample sizes between the two groups (formal and informal vendors), making it possible to make comparisons between them. Where perceived market barriers had significantly different distributions by market type, post-hoc tests were carried out by Chi-Square Test of Independence with 2,000 Monte Carlo simulated p values.

Distance travelled by produce impacts both product quality and cost to vendors, so the distance produce traveled in minutes was analyzed using OLS regression to determine which vendor characteristics explain distance travelled. In this case, our model was specified as:

$$(1) y_i = \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_K x_{iK} + \varepsilon_i, i = 1, \dots, n$$

where y is the dependent variable, distance (in minutes) travelled by produce, x_1, \dots, x_K are the explanatory variables, and i represents the n sample observations. The error term, ε_i , is assumed to follow a normal distribution and the coefficients, β_1, \dots, β_K , are parameters to be estimated (Greene 1991).

Variables included in the empirical specification of the model were: market type, gender, transporting agent (either farmer or vendor), postharvest handling method, transportation method, volume sold, presence of other primary income source(s), degree of problems encountered with infrastructure, and capital. It was hypothesized that formal markets might source their vegetables from farther away, given the larger volumes they require. When vendors transport produce themselves, rather than the farmers, they may be willing to travel farther. Among the informal vendors surveyed, no brokers or middlemen were used to transport produce.

Some supermarkets did have a third-party company that was responsible for providing and delivering fresh produce, but this was not common. It was hypothesized that when postharvest measures were taken, the distance traveled could be increased without reducing quality. The vendors who sell greater volumes, or who rely on selling vegetables as their primary source of income, may travel greater distances. Vendors who have greater problems with infrastructure and access to capital may be less likely to travel longer distances, and vendors with access to a private vehicle were hypothesized to travel farther than those on foot, using public transportation, motorcycles, or other means of transportation. Since the most common form of transportation was public transport (thirteen-passenger vans or *matatus* in Kenya), this was used as the reference variable for all other forms of transport. All analyses were carried out in R 3.1.2 (R Core Team 2015; Nakazawa 2015).

Results

Table 1 shows descriptive statistics for the sample, while Table 2 shows differences between formal and informal markets. Informal market vendors represent the majority of vendors, as well as the majority of the sample. Informal vendors were significantly more likely to be women than formal market vendors. Distance traveled was not significantly different between groups, although the average time taken for produce to reach the market through formal vendors was almost twice that of vendors in informal markets. Although only 32.5% of vendors sell to more than one market, these vendors were more likely to sell through formal markets. The most common form of transportation was public transportation (*matatus*), and this was more widespread among informal vendors. Private vehicles, on the other hand, were almost exclusively used by supermarkets. In general, the vendor was responsible for transporting the vegetables, although supermarkets often had third-party companies that provided produce and absorbed the cost of transportation.

Vendors purchase vegetables by the sack (used for measuring 50 kg of maize) and then re-bundle produce into 200–500 gram bunches that vary in size according to the season and price. Even though informal vendors were selling more produce than their formal counterparts, their gross incomes in both rainy and dry seasons were on average less than half of the formal retailers (shown in Kenyan Shillings, or KSH). This discrepancy may be attributed to the lower prices informal vendors charged for their bundles, as well as their treatment of unsold produce at the end of the day. Although most informal vendors (71.4%) resold the same produce the next day, 17.5% gave away their leftover produce, fed it to animals, or ate it themselves. Formal vendors were more likely to have arrangements with vendors to come and purchase back any unsold produce at the end of the day, which would help formal vendors mitigate any losses. No informal vendors had such arrangements.

The vast majority of vendors (97.0%) considered the market for ALVs to be growing. Surprisingly, formal vendors were not as optimistic, and 25% thought the market was either declining or showing no change. Formal vendors were significantly younger than informal vendors, but only half of each group considered vegetable sales to be their primary source of income. Formal markets offered more exotic vegetable species such as cabbage and collard greens, but there were no differences in the number of traditional species or total species.

Table 1. Descriptive Statistics of Variables for ALV Vendors.

Variable	Definition	Mean	SD
Vendor Characteristics			
Market type	=0 if a supermarket vendor, 1 otherwise	0.93	0.26
Gender	=0 if male, 1 if female	0.77	0.43
Age	Age of the vendor (years)	36.92	7.56
Income rainy	Average income per week from ALVs in the rainy season (KSH)	2775.63	3058.83
Income dry	Average income per week from ALVs in the dry season (KSH)	5625.96	6086.03
Primary income	=1 if selling produce is the primary source of income for the vendor, 0 otherwise	0.52	0.50
Traditional species	Number of traditional species sold	3.92	0.95
Exotic species	Number of exotic species sold	1.93	0.92
Total species	Total number of vegetable species sold	5.85	1.36
Transportation			
Distance	Distance traveled for vegetables to reach the market, in minutes	91.46	77.94
Other markets	=1 if a vendor sells ALVs at other markets as well, 0 otherwise	0.33	0.57
Matatu	=1 if produce is transported by public transportation, 0 otherwise	0.57	0.50
Motorcycle	=1 if produce is transported by motorcycle, 0 otherwise	0.24	0.43
Walk	=1 if produce is transported by foot, 0 other	0.04	0.19
Private vehicle	=1 if produce is transported by private vehicle, 0 otherwise	0.11	0.31
Other transport	=1 if produce is transported by other methods, 0 otherwise	0.04	0.20
Who transports	=0 if the vendor transports, 1 if the farmer	0.20	0.43
Who pays transport	=0 if the vendor pays, 1 if the farmer	0.05	0.25
Market Practices			
Volume sold	Number of sacks of produce sold per week	6.32	4.17
Price rainy	Price per bundle in the rainy season (KSH)	11.88	3.87
Pay rainy	Price paid to supplier per sack in the rainy season (KSH)	860.46	466.42
Postharvest	=1 if any postharvest measures are taken to maintain vegetable freshness, 0 otherwise	0.90	0.22
Resold	=1 if the produce left over at the end of the day is resold the next day, 0 otherwise	0.67	0.47
Market trend	=0 if the vendor has seen the market for ALVs grow in recent years, 1 if it has stayed the same or shrunk	0.03	0.17
Market Barriers			
Infrastructure	=0 if poor infrastructure is not a barrier to the vendor's market, 1 if a small problem, and 2 if a large problem	0.74	0.82
Municipal	=0 if municipal regulations are not a barrier to the vendor's market, 1 if a small problem, and 2 if a large problem	0.39	0.64
Season	=0 if seasonal fluctuations are not a barrier to the vendor's market, 1 if a small problem, and 2 if a large problem	0.94	0.67
Price	=0 if price fluctuations are not a barrier to the vendor's market, 1 if a small problem, and 2 if a large problem	0.79	0.75
Quality	=0 if poor quality is not a barrier to the vendor's market, 1 if a small problem, and 2 if a large problem	0.59	0.72
Capital	=0 if access to capital is not a barrier to the vendor's market, 1 if a small problem, and 2 if a large problem	1.48	0.73
Demand	=0 if consumer demand is a barrier to the vendor's market, 1 if a small problem, and 2 if a large problem	0.63	0.70
Perception	=0 if consumer perceptions are not a barrier to the vendor's market, 1 if a small problem, and 2 if a large problem	0.42	0.67

Note. All monetary values shown in Kenyan Shillings 100 KSH = 0.99 USD.

Table 2. Characteristics of Formal and Informal ALV Vendors.

	Formal Market		Informal Market		P value
	Mean	SD	Mean	SD	
Vendor Characteristics					
Gender	0.17	0.39	0.81	0.39	0.00***
Age	26.75	5.80	37.87	7.00	0.000***
Income rainy (KSH)	7104.17	8522.63	2419.86	1715.36	0.08*
Income dry (KSH)	14977.27	16807.52	4916.55	3614.54	0.08*
Primary income	0.56	0.53	0.52	0.50	1.00
Traditional species	3.42	1.24	3.96	0.91	0.16
Exotic species	2.75	0.45	1.87	0.91	0.00***
Total species	6.17	1.47	5.83	1.35	0.59
Transportation					
Distance (min)	161.67	197.80	85.95	57.48	0.22
Other markets	0.75	1.06	0.29	0.51	0.17
Matatu	0.17	0.39	0.60	0.49	0.005***
Motorcycle	0.17	0.39	0.25	0.43	0.74
Walk	0.00	0.00	0.04	0.19	1.00
Private vehicle	0.58	0.52	0.07	0.26	0.001****
Other transport	0.08	0.29	0.04	0.19	1.00
Who transports	0.50	0.67	0.17	0.40	0.02**
Who pays transport	0.42	0.67	0.03	0.16	0.001***
Market Practices					
Volume sold	2.25	0.83	6.47	4.17	0.007***
Price rainy (KSH)	18.92	4.42	11.34	3.27	0.00***
Pay rainy (KSH)	400.00	282.84	866.51	465.89	0.25
Postharvest	1.00	0.00	0.94	0.24	1.00
Resold	0.08	0.29	0.71	0.45	0.001****
Market trend	0.25	0.45	0.01	0.11	0.003***
Market Barriers					
Infrastructure	0.83	0.84	0.73	0.83	0.74
Municipal	0.08	0.29	0.42	0.65	0.31
Season	1.17	0.94	0.93	0.64	0.004***
Price	0.67	0.78	0.80	0.75	0.93
Quality	1.00	1.00	0.56	0.69	0.01***
Capital	0.46	0.82	1.55	0.67	0.001***
Demand	0.33	0.65	0.65	0.70	0.19
Perception	0.83	0.94	0.38	0.64	0.03**

Note. Significant differences denoted by asterisks * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$. All monetary values shown in Kenyan Shillings 100 KSH = 0.99 USD.

Perceptions about market barriers differed between formal and informal market vendors, although infrastructure and price variability were cited by both (Tables 2 and 3). Consumer perception was more often cited as a problem by formal market vendors, with some noting public unease about genetically modified vegetables (even though these are not available for ALVs). Seasonal variability was a problem for both informal and formal vendors, but more likely to be a small problem for informal vendors and a large problem for formal vendors. Poor quality produce was a much greater problem for formal vendors, while access to capital was a much smaller problem. For informal vendors, capital was cited as a large problem 64.7% of the time (Table 3). Overall, municipal regulations and consumer demand were not cited as problems by the majority of vendors, either formal or informal.

Table 3. Vendor Rating of Barriers to ALV Markets.

Market Barrier	Market Type	Not a problem	Small problem	Big problem
Infrastructure	Formal	0.42	0.33	0.25
	Informal	0.51	0.25	0.24
Municipal	Formal	0.92	0.08	0.00
	Informal	0.68	0.23	0.09
Season	Formal	0.33	0.17	0.50*
	Informal	0.25	0.59*	0.17
Price	Formal	0.50	0.33	0.17
	Informal	0.40	0.40	0.20
Quality	Formal	0.46	0.09	0.46*
	Informal	0.55	0.34	0.11
Capital	Formal	0.73*	0.09	0.18
	Informal	0.10	0.26	0.65*
Demand	Formal	0.75	0.17	0.08
	Informal	0.48	0.39	0.13
Perception	Formal	0.50	0.17	0.33
	Informal	0.70	0.21	0.08

Note. Asterisks indicate that the proportion was significantly higher than the other market type, at $p < 0.05$.

Distance travelled to reach the market may impact the quality of vegetables and cost to consumers, so time in minutes required to reach the market was modeled in Table 4. Market type significantly impacted distance, with formal vendors travelling 196 minutes more than informal market vendors. When produce was transported by the grower, it traveled thirty-seven minutes less than when the vendor was responsible for transportation. When vendors used private vehicles, transportation time increased by sixty minutes compared to using public transportation. Greater time spent in transportation was associated with increased perception of infrastructure as a limiting factor. The distance was not significantly impacted by the volume of vegetables sold or whether selling vegetable was the vendor's primary occupation, as these coefficients were not significant in the model (Table 4).

Table 4. Model of distance travelled in minutes for produce to reach market. Transportation method as compared to public transportation (Matatu).

	Estimate	Standard Error	t Value	p Value
Intercept	229.09	42.98	5.33	0.00***
Market type	-197.63	47.61	-4.15	0.00***
Gender	14.37	20.26	0.71	0.48
Primary income	7.01	13.07	0.54	0.59
Motorcycle	26.19	16.03	1.63	0.11
Walk	-2.37	29.13	-0.08	0.94
Private vehicle	59.95	28.32	2.12	0.04**
Other transport	46.26	31.87	1.45	0.15
Who transports	-36.93	20.48	-1.80	0.07*
Volume sold	1.43	1.46	0.98	0.33
Postharvest	6.49	22.51	0.29	0.77
Infrastructure	13.80	7.88	1.75	0.08*
Capital	10.05	9.65	1.04	0.30

Note. N = 131, AIC = 1476.9. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Discussion

The expansion of the formal market in Kenya, which is similar to other developing countries, may pose a risk to the informal market and the people who depend on it for their livelihoods. Although informal markets continue to hold the majority of ALV sales, the proportion of sales in the formal market has been increasing (Neven and Reardon 2004). This shift in balance is likely to open up opportunities in some sectors while closing others (Rao, Brummer and Qaim 2012; Rao and Qaim 2011; Rao and Qaim 2013) but each actor may not be able to adapt equally to the market environment. Rao and Qaim (2013) have suggested that farmers participating in supermarket channels are more likely to hire more female labor, although women are usually paid less than men for agricultural labor. Farmers participating in supermarket supply chains were also shown to be overwhelmingly male (Rao and Qaim 2011), and our data have confirmed that formal market vendors are much more likely to be male as well (Table 2). It is still not clear how formal market expansion into a traditionally female-controlled crop (Weinberger et al. 2011) will affect male and female stakeholders. In a similar case in which power over horticultural crops transitioned from primarily female to male hands, this change led to sometimes violent struggles over household resources, as well as increased accusations of witchcraft in a Kenyan agricultural community (Dolan 2001). The social costs paid by communities undergoing this transition are likely to accrue unequally to actors across the value chain.

Our data reveal a vibrant informal community that still persists in Eldoret, Kenya. Despite rapidly expanding supermarkets, the vast majority of ALVs are still traded informally. Informal markets may have advantages over formal markets in areas where vendors perceive market barriers differently. The shorter distance produce travels to reach informal markets may lead to improved quality, which is a characteristic that local consumers value and for which they are willing to pay premia (Chelang'a, Obare and Kimenju 2013; Croft, Marshall and Weller 2014). Informal market vendors may be at a disadvantage when accessing credit is necessary, as formal markets have much greater resources. Informal markets have fewer problems with seasonality so they can attract customers looking for a stable year-round supply and lower prices (Tables 2 and 3). This trend may be due to the fact that supermarkets depend on larger farmers to meet their greater volumes or quality standards (Rao and Qaim 2011), which may in turn limit the number of farmers who can supply supermarkets. This smaller base of farmers may make supermarkets more sensitive to seasonal fluctuations. On the other hand, informal vendors may have a much greater number of farmers from whom they can source, which can help them adapt to seasonal fluctuations in supply and keep their prices low. However, supermarkets may be able to target customers who value the convenience of completing all their shopping in one location and are willing to pay a premium for that convenience. These customers are still the minority in Eldoret, Kenya, and may be influencing the responses of formal vendors (25%) who did not see the ALV market as expanding.

Although the informal market still holds more than 90% of the fresh fruit and vegetable market (Neven et al. 2009), its future is not certain. Informal markets provide income for hundreds of informal vendors and easy access to nutritious vegetables for consumers in urban centers across Kenya. In order to support informal vegetable vendors, policymakers should improve access to credit for these small-scale businesses through private banks, government-subsidized loans, or

microcredit. Providing training on business skills may also help informal vendors, who sell more produce than formal markets but still make less in gross income. Improving infrastructure that connects urban and rural areas would benefit both formal and informal vendors, who may be able to maintain higher vegetable quality by cutting transport time and connecting more areas to urban markets. This may also address the seasonal unavailability of ALVs experienced primarily by formal vendors. Improved infrastructure could connect formal supply chains to a diversity of growers and increase the stability of the ALV supply in urban areas. More research needs to be conducted to better understand how women may be impacted by the changing balance between the formal and informal markets.

Conclusion

Despite the expanding formal market, informal vendors in open air markets still dominate the ALV market in Eldoret, Kenya, selling at both greater volume and lower price. In spite of their current position, there are threats to the sustainability of these businesses since their gross incomes from vegetable sales are less than half of the formal markets in both rainy and dry seasons (Table 2). Supermarkets face challenges establishing their vegetable market due to seasonal supply issues and low quality of vegetables, likely due to the increased length of time the vegetables spend en route to market. If they were able to source vegetables from a diverse set of local growers as do the informal market vendors, this could improve both the quality and stability of the vegetable supply in formal markets. Unlike the formal markets, however, informal markets are dominated by women and they face consistent problems accessing credit. Improving the ability for these small businesses to borrow money would help them grow their businesses and potentially invest more in postharvest handling to reduce produce losses from day to day. Since these businesses represent the vast majority of the market, reducing the market barriers they face could strengthen the supply chain and have a positive impact on both ALV growers and consumers. Investing in infrastructure could also help reduce transport times and link growers to markets, both formal and informal. Although many challenges still face the ALV supply chain, addressing market gaps and reducing barriers can improve access and availability of nutritious ALVs in western Kenya.

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