

# **Analysis of Demographic Factors that Influence the Purchasing Behaviour of Goat Milk and Their Implications for a Dairy Goat Breeding programme in Siaya County, Kenya**

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## **Abstract**

The dairy goat sector is one of the fastest growing livestock enterprises in Kenya because goat milk is becoming increasingly popular in the country. However, hardly any published studies exist that have utilized consumer purchase information to understand the factors that influence the purchase of goat milk. The current study analyzed consumer characteristics and factors that affected consumer behaviour in purchasing goat milk to serve as the basic data in formulating a marketing strategies for goat milk in Siaya County of Kenya. The research questions were approached in three phases. Firstly, the probability that a consumer purchases goat milk was estimated using a probit model framework. Secondly, a Heckman two-stage model was utilized to depict the relationship of dairy goat expenditures. Thirdly, the study examined the implications of the foregoing for a dairy goat breeding programme. Data were collected through in-depth interviews using comprehensive questionnaires. One thirty one (131) goat milk consumers were interviewed. The parameters of the present study are goat milk consumption, consumer characteristics and demographic factors that influenced the purchasing behaviour of goat milk. Family size, presence of children and elderly persons in the household, and household income influenced the purchasing of goat milk. Overall, income influenced the amount of goat milk to be purchased and, therefore, farmers should be encouraged and their capacity enhanced to target high income markets. Communication campaigns highlighting the benefits of goat milk to the children and the elderly persons could ensure enhanced success of marketing the milk. The findings imply that breeders of dairy goats should focus on improved yields, which will enhance returns from dairy goats. Demographic factors, along with agro-climatic and production constraints, are important to the overall success of dairy goat breeding programmes. Further, the breeding programme should identify the most promising breeds and eco-types under the prevailing production system for genetic selection and their multiplication under improved husbandry practices. Establishing a nucleus breeding scheme on private or government land to supply breeding stock can significantly contribute towards this goal. Generally, policy interventions are recommended to tackle demographic factors that influence the purchasing behaviour of goat milk and their implications for a dairy goat breeding programme. The findings of the present study will be useful to all actors in the dairy goat value chain.

**Keywords:** Purchasing behaviour, Goat milk, Dairy goat breeding programme, Kenya

## **1. Introduction**

The dairy goat sector is one of the fastest growing livestock sectors in Kenya (Ahuya 2005; Ogola *et al.* 2010). The progressive introduction of dairy goats into Kenya has placed emphasis on consumer driven market development of goat milk that can influence the success of a dairy goat enterprise (Jerop *et al.* 2014). According to Grunert *et al.* (2004), the potential for livestock products can be better tapped by consumer led product development. Demand for goat milk has been fueled by a general growing interest in organic products due to a complex mix of consumer concerns about food safety and nutrition. Goat milk consumption accounts for a small but growing percentage of the Kenyan dairy market. Over 70% of the milk sold in Kenya originates from cows and only 0.02% is from goats (Muriuki 2011). Goat milk costs more and is generally harder to find than conventional cow's milk and its popularity continues to grow. A study by Jerop *et al.* (2013) in the same area as the present study found that many consumers were willing to pay a premium to obtain goat milk. This implies that other factors other than price may influence purchase decisions with respect to goat milk.

Perception surveys that provide insight into consumer behaviour reveal that growth in goat milk sales is fueled by, among other reasons, its apparent therapeutic properties (Jerop *et al.* 2014). Some conventional supermarkets have noticed the growing popularity of goat milk and have started stocking it. Incidentally, there is a shortage of institutions that specialize in the processing of goat milk products. An increasing amount of processing is carried out by cottage industries, mainly by packaging, with a few making cheese as value addition. Many producers, therefore, rely on selling much of their milk as fresh produce.

As the goat milk market grows, one may speculate about the kind of consumers buying the milk. According to Kotler (1994), the major factors influencing the purchasing behaviour can be classified as cultural, social, individual and psychological. Cultural factors include a consumer's culture, subculture and social class. These factors are often inherent in people's values and decision processes. Social factors include groups (i.e., reference, aspirational and member groups), family, roles and status. These explain the outside influences of others on our purchase decisions, either directly or indirectly. Personal factors include variables like age and lifecycle stage, occupation, economic circumstances, lifestyle (i.e., activities, interests, opinions and demographics), personality and self-concept. These may explain why our preferences often change as our 'situation' changes.

Psychological factors affecting our purchase decision include motivation (Maslow's hierarchy of needs), perception, learning, beliefs and attitudes. While it is not an easy task to capture all these factors, various studies have shown that demographic variables as well as lifestyle and environmental attitudes define the organic consumer profile. It has been shown that regular consumers of organic food tended to be educated, affluent and of higher social class (Padel & Foster 2005; Stobelaar *et al.* 2006). Studies have also established that awareness and knowledge of food hazards were higher among females and individuals with more education and income (e.g., Torjusen *et al.* 2001; Stobelaar *et al.* 2006; Radam *et al.* 2010). Various studies have also found a strong correlation between consumption of organic food and levels of formal education (e.g., Lockie *et al.* 2002; Gracia & de Magistris 2007). The consumers of organic food tended to be older, came from tertiary-educated households and had higher income than those not purchasing organic food (Padel & Foster 2005). Generally, studies have found that presence of young children in the household significantly influenced decisions on food purchases.

Understanding the demographic factors that influence the likelihood that a consumer will purchase goat milk or share of household income spent on goat milk can help guide producers and marketers in gaining a better understanding of the most profitable customer bases to market dairy goat products. To discover the right niche market is a complicated task because demand is highly segmented among consumers who may be concerned with different attributes (Maria & Susan 2001). The largest numbers of consumers of goat milk are to be found along the informal dairy chain in Kenya. However, hardly any published studies exist that have utilized consumer purchase information to understand the demographic factors that influence the purchase of goat milk in the informal marketing channel, which is the focus of the current study.

Research questions in the current study were approached in three phases. Firstly, consumers' purchase of goat milk relative to purchase of conventional cow's milk was modeled in a probit model framework. Secondly, the share of goat milk was modeled by relying on the Heckman two-stage model. The argument is that consumers make two related decisions, i.e., consumers first decide whether to buy goat milk, and once this decision is made, they next decide how much of their budget to devote to purchase it. Thirdly, the implications of the findings on the foregoing on a dairy goat breeding programme were examined.

## **2. Theoretical framework of the study**

The Theory of Planned Behaviour is one of the most widely researched models for predicting factors influencing purchasing behavioural intentions. Armitage & Conner (2001) suggest that beliefs and their corresponding attitudes, subjective norms and perceived behavioural control influence purchasing intentions, which drive actual behaviour. Attitude is defined as the psychological emotion and the positive or negative evaluation that arise when an individual engages in certain behaviours (Eagly & Chaiken 1993). Subjective norms are the perceived opinions of significant others who are close/ important to an individual and who influence his/ her purchasing decision-making. Perceived behavioural control refers to an individual's perception of the possible difficulties when performing a specific behaviour (Ajzen 1991). Perceived behavioural control consists of two components, namely, frequency of occurrence of the facilitators or inhibitors of the behaviour and perception of the strength of the facilitators or inhibitors.

### 3. Conceptual framework of the study

Figure 1 below illustrates the conceptual framework model of the study. Among the key factors considered that may affect the purchase of goat milk include characteristics of individual rural households (e.g., household income, age of household head, education, presence of young children and elderly persons, household size, gender and price). The same variables are used to identify factors that influenced the amount of milk purchased conditioned on the choice to purchase goat milk over cow's milk.

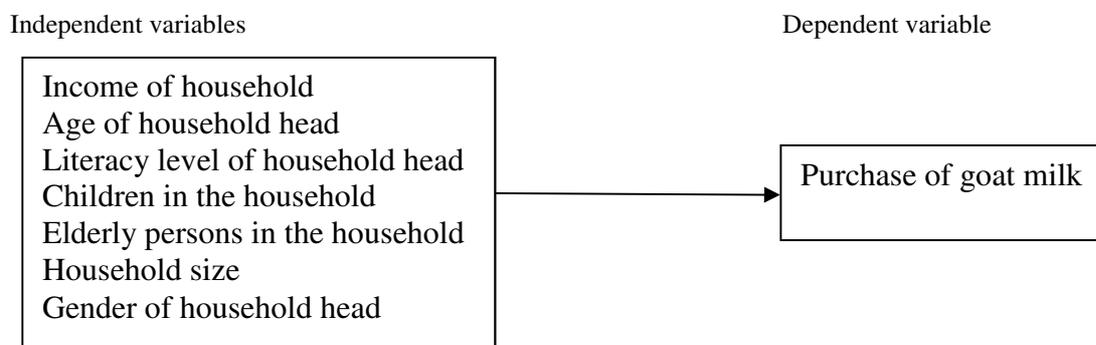


Figure 1: Conceptual framework model of the study

### 4. Research Methodology

#### 4.1. The study area, data sources and type

The study was carried out in Siaya County because of the various programmes in the area targeting improvement of people's livelihoods using dairy goats. Data was collected from 131 consumers of goat milk in the study area from various milk selling outlets stocking goat milk. This was complemented with snowballing to get more respondents, especially where farmers were selling the milk directly to consumers. This strategy was employed because of the absence of a sample list. Sets of structured and semi-structured questionnaires, organized into two sections, were used to collect the data. The first section was dedicated to obtaining information on demographic characteristics of the survey respondents like age, education, income, number of children 18 years and below, household size, presence and number of elderly persons, and gender.

#### 4.2. Data analysis

The data was subjected to both descriptive and inferential statistical analyses such as percentages, means, standard deviations, t-test and chi-square test. The Statistical Package for Social Scientists (SPSSv17) computer software was used for this purpose. STATA software was used for econometric analyses to capture factors affecting purchase of goat milk and how much the farmers bought. Table 1 below gives a description of variables surveyed and their expected signs.

The current study utilized Heckman two-stage model to understand which demographic factors influenced household expenditure on goat milk. Two sets of analyses were conducted. The first stage examined which demographic factors influenced the probability that a household would purchase goat milk; a probit model was used to analyze this question. The first stage produces the inverse Mills ratio ( $\lambda$ ), which accounts for the selection bias (i.e., the decision to participate in the purchase of goat milk). The  $\lambda$  is necessary because the estimators from the least squares model are consistent but the standard errors are not; the procedure passes along a correction factor from the first stage to the second stage to use in finding consistent estimates of the standard error (see Greene (2003) for a more detailed explanation). The second stage examined the two-stage decision process on amount of goat milk purchased. In the second stage of the Heckman model, demographic variables were regressed on the amount of goat milk purchased and the  $\lambda$ . The Heckman selection model (Heckman 1976; Greene 2003; Wooldridge 2013) assumes that there exists an underlying regression relationship as shown in equation 1 below:

$$y_j = x_j\beta + u_{1j} \quad (1)$$

The dependent variable, however, is not always observed. Rather, the dependent variable for observation  $j$  is observed if selection is as shown in equation 2 below;

$$z_j + u_{2j} > 0 \quad (2)$$

where;  $u_1 = N(0; \delta_1)$ ,  $u_2 = N(0; 1)$  and  $\text{corr}(u_1; u_2) = \rho$ . When  $\rho \neq 0$ , standard regression techniques applied to the first equation yield biased results. Heckman provides consistent, asymptotically efficient estimates for all the parameters in such models.

Table 1: Description of variables surveyed and their expected sign

| Variable             | Description                                 | Units                                  | Purchasing |        |
|----------------------|---|--|------------|--------|
|                      |   |  | decision   | level  |
| Purchase_Milk        | Purchase of milk                            | 1 = purchase of goat milk; 0 otherwise |            |        |
| Qbought_Milk         | Quantity of fluid milk bought               | Litres                                 |            |        |
| Independent variable |   |  |            |        |
| Age                  | Age of household head                       | Years                                  | +ve        | -ve    |
| HHedu1               | Education level of household head           | 1=literate, 0 = otherwise              | +ve        | +ve    |
| HHsize               | Household size                              | Number                                 | +ve        | +/- ve |
| Dependents           | Dependent number of members below 15        | Number                                 | +ve        | +ve    |
| Elderly              | Number of members more than 55 years of age | Number                                 | -ve        | -ve    |
| Gender               | Household head gender                       | 1=male, 0=otherwise                    | +ve        | +ve    |
| Pmilk                | Price of milk                               | Kenyan shillings                       | +ve        | +ve    |
| Income               | Income earned by household                  | Kenyan shillings                       | +ve        | +ve    |

## 5. Results and Discussion

### 5.1. Demographic characteristics

The characteristics of the household and household head like age, education, household size, income and gender are important in conducting product market acceptance studies because they influence consumption patterns and purchasing behaviour of consumers (Campiche *et al.* 2004). Table 2 below provides a summary of the demographic factors of the goat milk consumers who purchased and those that did not purchase goat milk. Overall, 59.41% of the interviewed female consumers purchased goat milk, while only 40.59% of the male respondents indicated that they did not purchase it. The mean age of all consumers was 45.75 years. Most of the respondents purchasing goat milk had attained primary (48.90%) and secondary (33.60%) levels of education. The two accounted for 82.50% of the cumulative percentage.

Table 2: Demographic characteristics of the dairy goat farmers surveyed

| Characteristic/ Variable              | Overall sample |        | Purchase  |        | Do not purchase |        |
|---------------------------------------|----------------|--------|-----------|--------|-----------------|--------|
|                                       | n= 131         |        | n= 101    |        | n= 30           |        |
|                                       | Frequency      | %      | Frequency | %      | Frequency       | %      |
| Gender                                |                |        |           |        |                 |        |
| Male                                  | 64             | 48.85  | 41        | 40.59  | 23              | 76.67  |
| Female                                | 67             | 51.15  | 60        | 59.41  | 7               | 23.33  |
| Total                                 | 131            | 100.00 | 101       | 100.00 | 30              | 100.00 |
| Age of household head (mean in years) | 45.75          | 14.53  | 45.74     | 13.96  | 45.8            | 14.34  |
| Education level of household head     |                |        |           |        |                 |        |
| None                                  | 8              | 6.10   | 6         | 4.60   | 2               | 1.50   |
| Primary                               | 64             | 48.90  | 43        | 32.80  | 21              | 16.00  |
| Secondary                             | 44             | 33.60  | 37        | 28.20  | 7               | 5.30   |
| Tertiary                              | 15             | 11.50  | 15        | 11.50  | 0               | 0.00   |
| Total                                 | 131            | 100.00 | 101       | 77.10  | 30              | 22.90  |

### 5.2. Factors affecting decision to purchase goat milk

Results of the first-stage probit model estimation of the factors that determined the decision by a consumer to purchase goat milk are presented in Table 3 below along with values of marginal effects. The model chi-square tests applying appropriate degrees of freedom indicate that the overall goodness of fit of the probit model was statistically significant ( $P < 0.01$ ). This shows that, jointly, the model fitted better than a model with no predictors. The McFadden's Pseudo  $R^2$  value obtained indicate that the independent variables included in the linear regression explained about 48.51% of the proportion of the variations in the consumer purchase decisions.

The probit model predicted approximately 88.0% of the cases correctly. Out of seven explanatory variables included in probit model, five were statistically significant. Results indicate that households' choice of purchasing goat milk sources was positively and significantly influenced by the number children and the elderly persons present, and income, and negatively influenced by average household size and gender. Males were less likely to purchase goat milk than females, with the possibility of purchasing goat milk decreasing by 8.0% when females were involved. This is plausible given the fact that women normally undertook purchases of household requirements.

As expected, the estimated coefficient for the variable household size was negative and significant, meaning that consumers with big families were less likely to buy higher levels of goat milk. An increase in family size would result in a 9.1% drop in the consumption of goat milk. This is consistent with the findings of Li *et al.* (2007), who opined that, presumably, there are some economies of scale that allowed per capita expenditure to decrease with increase in household size. The variable income was positive and significant to the purchase of goat milk. This meant that consumers earning higher income were more likely to purchase goat milk over conventional cow's milk. This indicates that income may be a limiting factor in the purchase of goat milk. Gracia & de Magistris (2007) found high income to influence the purchase of organic food. Education level was not significantly associated with the purchase of goat milk. This indicated that the purchase of goat milk took place regardless of education level. Despite this, the positive coefficient seems to reflect that those who were more educated tended to purchase goat milk compared to conventional cow's milk.

Decision on purchase of goat milk over conventional cow's milk was positively and significantly associated with households that had children under the age of six years. An increase in the number of children increased chances of purchase of goat milk by 18.0%. This finding agrees with those Lohr & Semali (2000) and Wier *et al.* (2008). It supports the notion from those studies that parents may be more concerned about food safety and related problems, especially when there are babies or young children living in the household. Additionally, having an elderly member in the household was also positively and significantly associated with purchase of goat milk. An increase in the number of elderly persons in the household would likely lead to an increase in the purchase of goat milk by 14.0%. This implies that the actual behaviour of purchase of goat milk may be tied to a particular belief. Various studies show that many buyers of goat milk perceived that the milk had a beneficial health component (Santos *et al.* 2005; Jerop *et al.* 2014).

Table 3: Factors that determined purchase decision of goat milk versus cow's milk in the surveyed area

| Variables                                     | Marginal | Coefficient | Std. Error | Z     | P> z | [95% Conf. Interval] |       |
|---|----------|-------------|------------|-------|------|----------------------|-------|
| Gender***                                     | -0.23    | -1.13       | 0.36       | -3.16 | 0.00 | -1.83                | -0.43 |
| Total household_size****                      | -0.09    | -0.47       | 0.12       | -3.90 | 0.00 | 0.71                 | -0.23 |
| Age   | 0.00     | 0.01        | 0.02       | 0.57  | 0.57 | -0.02                | 0.04  |
| Literate                                      | 0.13     | 0.51        | 0.75       | 0.68  | 0.50 | -0.96                | 1.99  |
| Income*                                       | 0.00     | 0.00        | 0.00       | 1.91  | 0.06 | -3.73e-06            | 0.00  |
| Child***                                      | 0.19     | 0.96        | 0.18       | 5.23  | 0.00 | 0.60                 | 1.32  |
| Elderly***                                    | 148193   | 0.76        | 0.27       | 2.85  | 0.00 | 0.24                 | 1.28  |
| Constant                                      |          | -0.71       | 1.10       | -0.64 | 0.52 | -2.85                | 1.44  |
| Number of observations = 131                  |          |             |            |       |      |                      |       |
| Wald chi <sup>2</sup> (15) = 67.25(0.0000)*** |          |             |            |       |      |                      |       |
| Log likelihood = -82.8729                     |          |             |            |       |      |                      |       |
| Pseudo R <sup>2</sup> = 0.4851                |          |             |            |       |      |                      |       |
| observed = 0.771                              |          |             |            |       |      |                      |       |
| Predicted = 0.884                             |          |             |            |       |      |                      |       |

Figures in parentheses are robust standard errors. \*\*\*, \*\*, and \* indicate statistical significance at P<0.01, 0.05 and 0.1, respectively.

### 5.3. Factors affecting amount of goat milk purchased

The factors that influenced the amount of milk purchased were estimated using a linear regression, with identified variables from the probit model while incorporating the  $\lambda$ . Table 4 below shows the results of the second stage of the Heckman model. The  $\lambda$  had an insignificant effect on quantity marketed, suggesting absence

of selection bias. This means that the error term of the choice in purchasing goat milk and the intensity to purchase were not correlated (Wooldridge 2013). If there is no evidence of sample selection, consistency of ordinary least squares (OLS) will not be affected (Wooldridge 2013). The models returned an adjusted  $R^2$  of 0.27.

With respect to income, the results reveal that a high-income level had a significant influence on the households' decision on the quantity of goat milk purchased. This finding agrees with that of Wier *et al.* (2008), who established that disposable income increased the budget share allocated to organic food. It also appears that, although price was not significant, a price increase would lead to a decrease in the goat milk purchased.

Table 4: Factors affecting amount of goat milk purchased in the surveyed area

| Variable                  | Coefficient | Std. Error | T     | P> t | 95% Confidence Interval |      |
|---------------------------|-------------|------------|-------|------|-------------------------|------|
| Gender                    | -0.13       | 0.18       | -0.71 | 0.48 | -0.48                   | 0.23 |
| Age                       | -0.00       | 0.01       | -0.22 | 0.82 | -0.01                   | 0.01 |
| Child                     | 0.22        | 0.14       | 1.55  | 0.12 | -0.06                   | 0.49 |
| Elderly                   | 0.12        | 0.14       | 0.92  | 0.36 | -0.14                   | 0.39 |
| Price                     | 0.00        | 0.01       | -0.11 | 0.91 | -0.02                   | 0.02 |
| Household size            | -0.05       | 0.08       | -0.71 | 0.48 | -0.20                   | 0.10 |
| Income***                 | 0.00        | 0.00       | 4.54  | 0.00 | 0.00                    | 0.00 |
| Literacy level            | 0.03        | 0.32       | 0.10  | 0.92 | -0.59                   | 0.65 |
| Mills ratio ( $\lambda$ ) | 0.37        | 0.44       | 0.85  | 0.39 | -0.48                   | 1.22 |
| Constant                  | 0.33        | 0.83       | 0.39  | 0.69 | -1.30                   | 1.95 |

Number of observations = 131  
 F(18, 260) = 6.81  
 F\*\*\* = 0.0000  
 R-squared = 0.3206  
 Adj R-squared = 0.2735

Figures in parentheses are robust standard errors. \*\*\*, \*\*, and \* indicate statistical significance at  $P < 0.01$ , 0.05 and 0.1, respectively.

#### 5.4. Implications of the findings to a dairy goat breeding programme

Consistently, the choice to purchase goat milk and the quantity purchased were related to income and, indirectly, income correlated with price. This suggests that the niche market for goat milk was to be found amongst the affluent, implying that household income can be a barrier to the purchase of goat milk. High price could also be an indicator of low supply of the milk. This makes it imperative for breeders to focus on breeding for improved yield. A proactive breeding strategy should, therefore, be pursued by the dairy goat sector to deliver more milk. Producers can improve productivity and returns from dairy goats through selective breeding and control of reproduction. Reproductive performance of dairy animals is affected by factors like the environment, animal nutrition, producers' socio-economic conditions, adaptability of animals and their genetic characteristics, and type of production system (i.e., intensive or extensive) (Turner 1986).

Reproductive efficiency (e.g., kidding interval and conception rate) can be improved by using genotypes that are suitable to the production environment and appropriate husbandry practices. However, for evolving selection and breeding strategies for dairy goat production, comparative productivity data are needed for breeding programmes in place within the country. One should always keep in mind the various socio-economic and agro-climatic aspects along with the production constraints because they are important to the overall success of such programmes. The breeding programme should identify the most promising breeds and eco-types under the prevailing system of production for genetic selection and their multiplication under improved husbandry practices. One way of ensuring this is by having private or government nucleus breeding flocks within the ecosystem in which the dairy goats are kept. Husbandry practices should be as comparable as possible to farming practices in the area. In principle, breeding programmes must have expected outputs consistent with the producer's objectives and be driven by incentives from the market to justify the producer's investment (Kosgey *et al.* 2006). The bottom line is that successful adoption of a technology depends on its compatibility with the needs of the farmer and the production system. It has to be relatively simple and cheap, and, above all, involve relatively low risks (Kosgey 2004). Further, an appropriate breeding strategy must address both short- and long-term concerns through proper planning to ensure that a breeding programme does not regress in its overall objectives (Ogola & Kosgey 2012).

## 6. Conclusion and Recommendations

The study provides evidence that market for goat milk was driven by consumer preferences. The consumers in this niche market were prepared to pay more for goat milk if they could get what they wanted, when they wanted it and how much they wanted. This may be driven by perception on positive health effects of goat milk, which presents ample room for development of the goat milk sector. Additionally, goat milk can be fortified to target the nutritional needs of the young and elderly persons. Communication campaigns highlighting the benefits of goat milk to the children and elderly persons could ensure success of marketing goat milk. However, the success of this strategy is uncertain because the purchase of goat milk seems to favour those whose income is high. Repackaging or selling milk in smaller containers or per volume may address the issue of price in the short term. In the long term, a viable strategy to increase goat milk production is through the use of improved genetics or breeding practices, animal husbandry and extension services. This may eventually contribute to making goat milk more available and the likelihood of reduction in the price of milk. Demographic and agro-climatic aspects, together with production constraints, are crucial to the overall success of a dairy goat breeding programme. The breeding programme should identify the most favourable breeds and eco-types under the prevailing production system for genetic selection and their multiplication under better husbandry practices. Establishing a nucleus breeding scheme on private or government land to supply breeding stock can significantly contribute towards this goal. Generally, policy interventions are recommended to tackle demographic factors that influence the purchasing behaviour of goat milk and their implications for a dairy goat breeding programme. The findings of the current study will be valuable to all actors in the dairy goat value chain.

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