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Determinants of Dog Owners' Willingness to Feed Their Dogs on Black Soldier Fly Larvae Meal in Kenya

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As the demand for sustainable pet food increases, Black Soldier Fly Larvae (BSFL) have emerged as a promising alternative protein source. However, there is a lack of knowledge regarding the acceptance and viability of these advancements. This study investigated the willingness of dog owners in Nairobi and Kisumu, Kenya, to feed their dogs with BSFL-based diets. A cross-sectional survey involving 384 dog owners was conducted using snowball sampling. Face-to-face interviews using semi-structured questionnaires were conducted, and data were analysed through binary logistic regression. Results showed that 72% of respondents expressed willingness to adopt BSFL-based feed, although 58.6% had no prior awareness of it. Key motivators included perceived nutritional benefits (70.83%), improved dog appearance (63.03%), and cost-effectiveness (65.11%). Significant predictors of willingness to feed included county of residence (OR = 6.909, $p < 0.001$), age (OR = 0.935, $p < 0.001$), employment status (OR = 0.269, $p = 0.012$), occupation (OR = 0.431, $p = 0.009$), perceived benefits (OR = 3.474, $p = 0.001$), and perceived risks (OR = 0.415, $p = 0.018$). Education level ($p = 0.075$) and household size ($p = 0.062$) were marginally significant. These findings emphasise the role of socio-economic and perceptual factors in shaping consumer acceptance. Public education campaigns, veterinary engagement, and strategic marketing are critical to enhancing uptake of BSFL-based dog food and advancing sustainable pet nutrition in Kenya.

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INTRODUCTION

Globally, pet ownership is on the rise, with estimates indicating that over 50% of households now own either a cat or a dog. This growing trend is largely attributed to factors such as increasing affluence, smaller family sizes, a rise in single-person households, urbanisation, higher life expectancy, and the humanisation of pets (Alexander et al., 2020; Murray, 2025). Pets are increasingly regarded as family members, offering companionship, affection, and protection. Owners often value the emotional bonds they share with their pets and the positive impact these relationships have on their overall quality of life (Bosch & Swanson, 2021). According to statistics reported by the Fédération Cynologique Internationale (FCI), the approximate total number of dogs (purebred or not) in the world is around 147 million (Kępińska-Pacelik & Biel, 2022).

In line with the humanisation of pets, many dog owners globally are now considering numerous important factors—beyond just cost—when selecting diets for their dogs (Banton et al., 2021; Boukid & Rosentrater, 2025). This shift in consumer behaviour has fueled the rapid growth of the pet food industry, with global sales reaching USD 125 billion by 2020 (Valdés et al., 2022). Studies have shown that pet owners typically exhibit higher levels of empathy toward animals compared to non-owners (Taylor & Signal, 2005), which leads them to select diets they perceive as nutritious and beneficial for their pets' health and well-being (Remillard, 2008; Dodd et al., 2019).

Nutrition plays a critical role in a pet's overall health, making dietary choices one of the most important decisions a pet owner can make (Thomas & Feng, 2020). These decisions are often influenced by the owner's knowledge of pet nutrition, perceptions of the pet food industry, ingredient safety, and the credibility of information sources (Thomas & Feng, 2020; Thomson et al., 2008).

In recent years, insects have gained attention globally as a sustainable and innovative protein source for pet food (Triggs et al., 2025; Fischer, 2024; Pinney & Costa-Font, 2024). Bosch and Swanson (2021) provided a comprehensive review highlighting the palatability, digestibility, and nutritional potential of insects in dog and cat diets. Commonly explored insect-based ingredients include meal and fat derived from adult house crickets, mealworm larvae, and black soldier fly larvae (BSFL). Penazzi et al. (2021) emphasised BSFL's potential as a sustainable protein alternative in pet food, while Higa et al. (2021) found BSFL to be both promising and consumer-acceptable as a substitute for conventional livestock-based proteins. However, Alagappan et al. (2022) noted that regulatory constraints around the use of BSFL have limited its commercial application. Currently, seven insect species are authorised for use in pet food in the EU and UK, with the most commonly used being house crickets, yellow mealworms, and black soldier flies (Pinney & Costa-Font, 2024).

At the regional level, the pet food industry is also experiencing significant growth in Africa, mirroring global trends. For instance, in South Africa, pet food

revenue has risen exponentially to 226.70 million US dollars in 2024, reflecting a revenue change of 16.2% (Kalicharan et al., 2025). This growth can be attributed to increasing urbanisation, rising middle-class populations, and the growing perception of pets as integral household members. As more African households acquire pets, demand for quality, safe, and nutritious pet food is expected to increase, opening up new markets for innovative protein sources such as insect-based meals.

In Kenya, pet ownership is substantial and continues to grow. There are an estimated 5 to 6 million dogs in the country, with more than 80% believed to be owned (Muinde et al., 2021). The trend of pet humanisation is similarly evident, influencing dietary decisions among Kenyan dog owners. Despite the global shift toward more sustainable pet food options, including insect-based proteins, there remains a limited understanding of how the socio-economic characteristics of dog owners influence the acceptance of such alternatives in Kenya. While factors such as ingredients, pricing, health and nutrition, and freshness are known to influence dog food choices (Banton et al., 2021), the specific variables shaping Kenyan consumers' perceptions of BSFL-based dog food have not been sufficiently explored.

This study aims to address this knowledge gap by exploring dog owners' willingness to incorporate BSFL into their pets' diets and identifying the socio-economic factors that influence these decisions using data from a sample of dog owners in two major counties that house major cities in Kenya. Gaining insight into consumer preferences and decision-making processes is crucial for veterinarians and pet nutrition experts to better guide pet owners toward informed, objective dietary choices for their animals.

METHODOLOGY

Study Area and Design

This study was conducted in Nairobi and Kisumu counties, Kenya, using a cross-sectional design.

Nairobi, the capital city, and Kisumu, the third-largest city, were purposively selected due to their urban settings and relatively high domestic dog populations. Although the exact number of dog owners in these counties was unknown at the time of the study, the sample size was determined using the proportionate-to-size sampling method based on the formula by Anderson et al. (2007), as shown in equation 1:

$$n = \frac{pqz^2}{e^2} \quad (1)$$

Where n = sample size for the study.

p = Proportion of the population containing the variable of interest (proportion of dog owners) in the area, hence $P=0.5$, we assume 50% of the households in the study area own a dog

q = Weighting variable computed as;
 $q = 1 - p = 1 - 0.5 = 0.5$

z = Confidence level at 95% (standard value is 1.96).

e = Allowable error term. Since the proportion of the population is not known with certainty. According to Anderson *et al.* (2007), an error of less than 10% is usually acceptable. Hence, we used an error of 5%.

$$n = \frac{pqz^2}{e^2} = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2} = 384 \quad (2)$$

Using these parameters, a sample size of 384 dog owners was calculated as in equation 2.

Participant selection followed a two-stage random sampling procedure. First, three administrative sub-counties were randomly selected from each county, yielding six sub-counties in total. In the second stage, sampling frames were developed using sub-county dog vaccination registers. Assuming that half of all households owned at least one dog, a

systematic random sampling technique was applied to select households, with selection probability proportionate to the estimated dog population in each sub-county. In households with more than one dog, only one interview was conducted to avoid duplication.

Data Collection and Analysis

Data were collected through a structured questionnaire developed specifically for this study. Before the actual survey, the tool was pretested to assess clarity and relevance. Feedback obtained during the pretest informed necessary revisions, including rewording certain items for better respondent understanding. Face-to-face interviews were conducted in collaboration with local administrative authorities to facilitate community access and trust. This method was chosen over alternatives such as telephone or mail surveys due to its ability to yield higher response rates and allow for real-time clarification of questions (Mackenzie & Knipe, 2006; Hussain et al., 2013). Participation was voluntary, and interviews were conducted only after obtaining written informed consent. Respondents were either the household head or an adult member aged 18 years and above. The questionnaire comprised two main sections: one capturing socio-demographic characteristics of the respondents and the other assessing their willingness to feed dogs on BSFL food. Quantitative data were analysed using descriptive statistics and logistic regression using SPSS version 26.

Analytical Framework

Logistic regression can be seen as a method that is comparable to multiple linear regression. However, it considers the fact that the dependent variable is categorical (Pituch & Stevens, 2020). Some fundamental issues with using a linear regression model when the dependent variable is binary include the error term's non-normality, heteroscedasticity, the potential that the result would not fall within the range of 0 to 1, and

generally a low coefficient of determination (Gujarati & Porter, 2009). The estimated result? Will always fall between the logical limits of 0 and 1, as per the logit and probit models. Therefore, a binary logit regression model was applied to examine how various factors affected dog owners' willingness to feed their dog on BSFL.

The logit regression model was chosen since numerous studies have shown that it may be used to examine farmer willingness in dog feeding. The probit model does not perform better in practical research than the logistic distribution due to the computational difficulties caused by the lack of a closed form for the normal cumulative density function, which the probit model is based on (Ai & Norton, 2003). The dependent variable for the current study was the willingness to feed on BSFL, with a value of 1 (if the dog owner is willing to feed their dog on BSFL) and 0 (if the dog owner is not willing to feed their dog on BSFL). Table 1 displays the independent variables along with their VIF values. This model is a predictor of the response variable (willingness to feed their dog on BSFL) from the independent variables. The relationships were tested at a statistical significance level of $p < 0.05$. The possibility that the dog owner is willing to feed their dog on BSFL is predicted by odds ($Y=1$); that is, the ratio of the probability that $Y=1$ to the probability that $Y \neq 1$, as shown in equation (3).

$$\text{Odd } Y = P(Y = 1)/(1 - P(Y = 1)) \quad (3)$$

The binary logit regression model is presented in equation (4).

The logit (Y) is given by the natural log of odds;

$$\ln \left\{ \frac{p(Y_i=1)}{1-p(Y_i=1)} \right\} = \log \text{ Odds} = \text{Logit } (Y) \quad (4)$$

This can be expanded as in equation 5;

$$\text{Logit}(Y) = \alpha + \sum \beta_1 X_1 + \sum \beta_2 X_2 + \dots + \sum \beta_n X_n + \varepsilon_i \quad (5)$$

Where Y = dependent variable (willingness to feed their dog on BSF) with 1= willingness to feed and 0= not willing to feed;

α = intercept

ε_i = error term

$\beta_1, \dots, \beta_n$ = coefficients of the independent variables

$X_1, \dots, X_n$ = the independent variables (X_1 - X_{17})

$p(Y_i = 1)$ = probability of a dog owner willing to feed the dog on BSFL

$1 - p(Y_i = 1)$ = probability of unawareness of BSFL

and $\ln$ = natural log

To quantify the immediate consequences of changes in the explanatory variables on the projected likelihood of awareness while keeping other explanatory variables fixed, marginal effects were computed.

Test for Multicollinearity

A multicollinearity test was performed through the computation of the variance inflation factor (VIF) to ensure that the explanatory variables included in the model were not associated with one another. An estimation of a simple ordinary least squares (OLS) regression was done for the dependent variable and the remaining explanatory variables. In ordinary least squares regression, the VIF gauges how severe the multicollinearity is. Gujarati (2003) states that VIF demonstrates how the presence of multicollinearity causes an estimator's variance to be inflated. VIF is calculated using the formula shown in equation 6.

$$VIF = \frac{1}{1-R_i^2} \quad (6)$$

Where R_i^2 is the R² of the regression with the i th independent variable as a dependent variable. The results of the VIF are presented in Table 1.

Table 1: VIF Results

Variable	VIF	1/VIF
Number of dogs owned (X_1)	2.54	0.3932
Age (X_2)	2.46	0.4064
County (X_3)	1.91	0.5240
Average income (X_4)	1.79	0.5602
Employment status (X_5)	1.62	0.6175
Quantity of feed per week (X_6)	1.57	0.6382
Occupation (X_7)	1.54	0.6512
Perceived risks (X_8)	1.51	0.6632
Cost of feed per week (X_9)	1.48	0.6743
Household size (X_{10})	1.45	0.6919
Marital status (X_{11})	1.41	0.7068
Education level (X_{12})	1.29	0.7759
Gender (X_{13})	1.26	0.7907
Nationality (X_{14})	1.16	0.8593
Perceived benefits (X_{15})	1.14	0.8765
Dogs vaccinated (X_{16})	1.13	0.8841
Quantity of dog food per day (X_{17})	1.09	0.9176
Mean VIF	1.55	

The average VIF is 1.55. The explanatory variables have a VIF ranging from 1.09 to 2.54. The VIF of the independent variables is under five. It was determined that there were no significant correlations between any of the independent variables, eliminating the likelihood of multicollinearity.

RESULTS AND DISCUSSION

Demographics of the Respondents

The findings in Table 2 reveal several significant associations between demographic factors and the county of residence among dog owners in Nairobi and Kisumu. The gender distribution was notably different between the two counties, with a higher proportion of male respondents ($n=253$) compared to females ($n=131$). The statistical significance of gender distribution at the 1% level suggests possible cultural or socioeconomic factors influencing pet ownership among men and women in these areas. Previous research has indicated that pet ownership patterns can vary significantly based on gender, with men more likely to own certain types of pets, including dogs, possibly due to traditional roles or societal norms (O'Bryan et al., 2015).

However, the chi-square test revealed that the association between education level and county of residence was not significant. This lack of significance might reflect similar educational opportunities or access to information about pet care across both counties, as indicated in studies that show uniform access to education and pet-related information in urban regions of Kenya (Gikonyo et al., 2018).

In contrast, marital status exhibited a statistically significant difference at the 1% level between Nairobi and Kisumu dog owners. This could be

attributed to differences in household structures and the influence of family dynamics on pet ownership. Research has shown that married individuals or those in stable relationships are more likely to own pets, particularly in urban areas where companionship and security are valued (Hirschman, 1994). Regarding employment status, the chi-square test found no significant association with the county of residence, suggesting that employment levels or types of employment among dog owners are relatively similar in Nairobi and Kisumu. This finding is consistent with studies indicating that urbanisation tends to homogenise employment opportunities and lifestyles, which may extend to pet ownership behaviours (Muthee & Gichuhi, 2020). Occupation showed a statistically significant difference at the 5% level between residents of Nairobi and Kisumu, possibly reflecting the diverse economic activities predominant in these counties. Nairobi, as the capital city, has a more diversified economy, which might influence the types of occupations held by dog owners, compared to Kisumu, where agriculture and trade are more dominant (Kariuki, 2019).

The lack of a significant association between dog vaccination and county of residence suggests that vaccination practices may be uniformly adopted across both regions, potentially due to widespread awareness campaigns and access to veterinary services (Gikonyo et al., 2018). However, the significant difference in dog registration at the 1% level could indicate variations in local policies or enforcement practices between Nairobi and Kisumu, as well as differing levels of compliance among dog owners, a finding that aligns with studies on regional disparities in animal registration practices (Mwangi et al., 2021).

Table 2: Categorical Variables for Dog Owners' Characteristics

Variable		Kisumu (n)	Nairobi (n)	Total (n)	Chi ²
Gender	Male	180	73	253	52.054*
	Female	43	88	131	
Education level	Secondary	18	205	223	2.130
	Tertiary	7	154	161	
Marital status	Single	58	73	131	25.143*
	Married	160	76	236	
	Other	5	12	17	
Employment status	Unemployed	61	42	103	0.058
	Employed	162	118	280	
Occupation	Farm	28	9	37	13.105**
	Off-farm business	34	28	62	
	Salaried	153	105	258	
	Student	8	18	26	
Dog Vaccinated	Yes	216	158	374	0.600
	No	7	3	10	
Dog registered	Yes	11	47	58	42.411*
	No	210	114	324	

*, **, Significant levels at 10% and 5%, respectively

The mean age of the dog owners was 44 years, with each household owning approximately three dogs. Weekly, they used an average of 9.94 kilograms of

dog food, incurring an estimated cost of Ksh 1,979, as detailed in Table 3.

Table 3: Continuous Variables for Dog Owner Characteristics

	Minimum	Maximum	Mean	Std. Deviation
Age of the Respondent (Years)	19	103	43.99	19.871
Dogs Owned	1	15	2.69	2.098
Quantity per week (Kg)	1	100	9.94	7.923
Cost per week	200	21003	1979.07	1783.928

Table 4 reveals the types of feed that dog owners use, showing a preference for processed food, followed by leftover food from home and restaurants. Specifically, 57.81% of dog owners use processed food, while 50.26% use leftover food from home, 18.23% use leftover food from restaurants, and 12.50% use raw food. These preferences reflect broader trends in pet food consumption and align with findings from empirical studies on dog nutrition.

Processed food emerges as the most common choice among dog owners, which is consistent with literature indicating its popularity due to convenience and formulation benefits. A study by

German et al. (2004) found that processed dog foods are designed to meet the nutritional requirements of dogs and offer the benefit of a balanced diet with consistent quality. Processed foods often contain a mix of meat, grains, vitamins, and minerals, which helps ensure a comprehensive nutrient profile (Miller et al., 2015). This aligns with the high percentage of dog owners (57.81%) opting for processed food.

Leftover food from home is the second most common choice, used by 50.26% of respondents. This practice is prevalent among pet owners who prefer to use food that would otherwise be discarded. Research by Koppel et al. (2015) notes

that while this can reduce food waste, it may not always meet the nutritional needs of pets, potentially leading to imbalances if not carefully managed. This finding highlights the need for dog owners to be aware of the nutritional adequacy of the leftovers they provide.

Leftover food from restaurants is used by 18.23% of respondents. While this practice is less common, it reflects a similar trend of utilising available food resources. Studies such as those by Watson and Watson (2012) suggest that restaurant leftovers can vary widely in nutritional quality, which may not always be ideal for dogs. This variability can impact

the overall health of pets, underscoring the importance of balanced nutrition.

Raw food, chosen by 12.50% of respondents, represents a smaller but significant segment of dog owners. Raw feeding, or "BARF" (Bones and Raw Food), is often advocated by proponents who believe it closely mimics a natural diet (Freeman et al., 2013). However, the raw food diet can pose risks if not properly managed, including nutritional imbalances and potential contamination, as highlighted by the American Veterinary Medical Association (AVMA, 2020).

Table 4: Type of Feed Dog Owners Use

What type of feed do you give to your dog?	Frequency	Percentage
Leftover food from home	193	50.26
Leftover food from restaurants	70	18.23
Processed food	222	57.81
Raw food	48	12.50

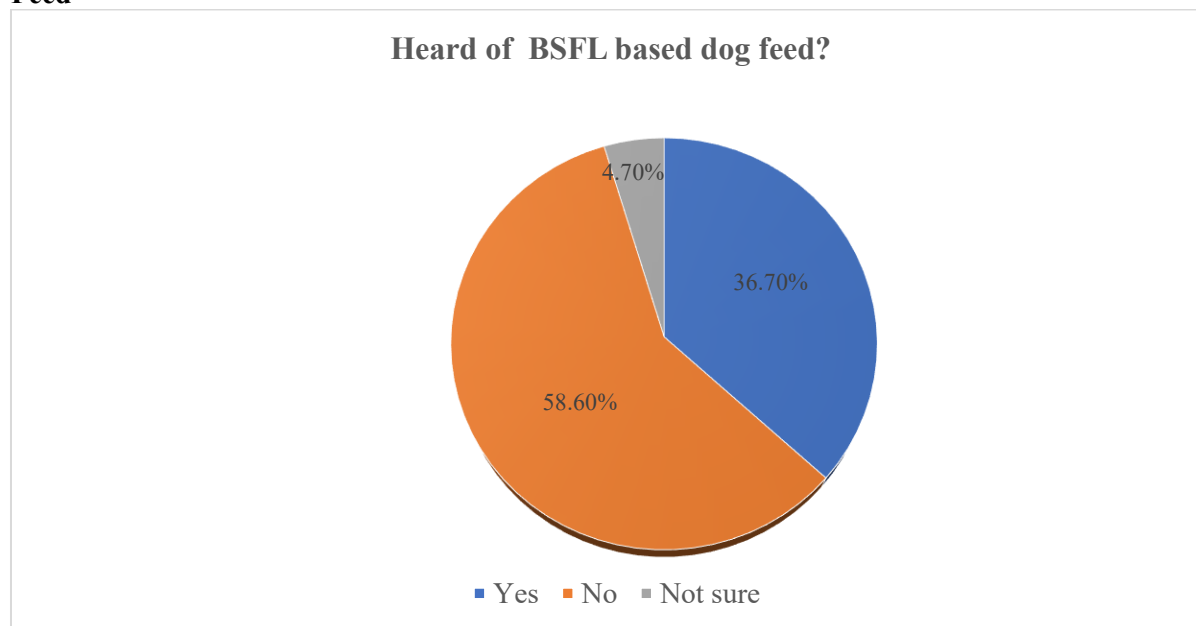
Awareness Levels of Dog Owners Regarding Black Soldier Fly Larvae (BSFL)-Based Dog Feed

Figure 1 provides valuable insights into the awareness levels of dog owners regarding Black Soldier Fly Larvae (BSFL)-based dog feed. According to the results, a significant majority of respondents, 58.6%, indicated that they had not heard of BSFL-based dog feed. This lack of awareness is a critical barrier to the adoption of BSFL as an alternative protein source in pet foods. It aligns with findings from previous studies that highlight the novelty of insect-based pet foods and the general lack of consumer awareness regarding such products (Duijnisveld, 2022).

On the other hand, 36.7% of respondents reported that they had heard of BSFL-based dog feed, suggesting a moderate level of awareness within the population. This group represents potential early adopters who could drive market demand if adequately informed about the benefits and

sustainability of BSFL as a pet food ingredient. The relatively small percentage of respondents (4.7%) who were unsure about their awareness of BSFL-based dog feed underscores the need for more targeted educational campaigns to clarify what BSFL-based dog food is and why it might be a beneficial option.

These findings emphasise the importance of increasing public awareness and education regarding the benefits of BSFL in pet diets. As noted by Fantechi et al. (2024), overcoming food neophobia and increasing market acceptance require informative campaigns that effectively communicate the health, nutritional, and environmental benefits of BSFL-based products. Given the growing interest in sustainable pet foods and the potential health benefits of BSFL, as documented by Lei et al. (2019) and Seo et al. (2022), enhancing awareness could significantly boost the acceptance and adoption of BSFL-based dog feed in Kenya and beyond.

Figure 1: Awareness Levels of Dog Owners Regarding Black Soldier Fly Larvae (BSFL)-Based Dog Feed

Motivation for Using BSFL in Dog Food

Table 5 details motivations for using Black Soldier Fly Larvae (BSFL) in dog food provides significant insights into consumer preferences, with notable differences between genders. According to the results, a substantial proportion of respondents were motivated by the nutritional benefits of BSFL (70.83%), the improvement in the general appearance of dogs (63.03%), and the potential to reduce feeding costs (65.11%). These motivations are supported by empirical research, which highlights the advantages of BSFL in pet food.

Numerous studies have demonstrated the nutritional benefits of BSFL. For instance, St-Hilaire et al. (2007) reported that BSFL are rich in protein and fat, which makes them a highly nutritious option for animal feed. This finding aligns with the current study, where a significant percentage of respondents (70.83%) indicated that the nutritional value of BSFL was a primary motivation for their use. Additionally, research by Oonincx et al. (2010) confirms that BSFL have a favourable nutrient profile compared to traditional feed ingredients,

reinforcing the importance of the nutritional benefits observed in the survey.

The motivation related to the improvement of the general appearance of dogs, which was reported by 63.03% of respondents, is also supported by past research. van Broekhoven et al. (2015) found that diets enriched with BSFL can enhance the coat quality and overall health of pets. This is attributed to the high levels of essential fatty acids and amino acids found in BSFL, which contribute to better coat condition and overall appearance, as confirmed by Janssen et al. (2017).

Furthermore, the cost reduction aspect was a significant motivation for 65.11% of respondents. Past studies have indicated that BSFL can be a more cost-effective alternative to traditional feed sources. Doberman and Smith (2017) found that BSFL production is often more economical than conventional animal feed due to their rapid growth rate and minimal resource requirements. This supports the current study's findings, where cost-efficiency was a notable motivation for using BSFL.

Table 5: Motivation for Using BSFL in Dog Food

Motivation	Male (%)	Female (%)	Overall (%)	Chi-square
To improve the general appearance of the dog	28.13	34.90	63.03	429.005**
Because it is nutritious	32.55	38.28	70.83	453.961**
To reduce the feeding cost of the dog	28.39	36.72	65.11	432.485**

χ^2 : Chi- square coefficient; **: $p < 0.01$,

Factors Influencing Dog Owners' Willingness to Feed Their Dogs Black Soldier Fly Larvae (BSFL) Food

This study examined the determinants of dog owners' willingness to feed their dogs on Black Soldier Fly Larvae (BSFL) using logistic regression analysis. The results, presented in Table 6, reveal several statistically significant predictors, offering insights into the socio-demographic and perceptual factors that influence acceptance of BSFL-based dog food.

County of residence emerged as a highly significant predictor (OR = 6.909, $p < 0.001$), indicating that respondents from certain counties were nearly seven times more likely to accept BSFL food. This underscores the influence of geographical and cultural contexts in shaping food acceptance behaviour, consistent with previous findings by Verbeke (2015), which emphasised the role of local dietary practices and cultural norms in the adoption of insect-based foods.

Age was negatively associated with willingness (OR = 0.935, $p < 0.001$), suggesting that younger dog owners are more receptive to BSFL. This aligns with House (2016), who reported that younger individuals exhibit greater openness to novel foods, including those of insect origin, due to heightened environmental consciousness and lower levels of food neophobia. Fantechi et al. (2024) further recommend that targeted informational campaigns may be necessary to mitigate age-related reluctance.

Employment status (OR = 0.269, $p < 0.05$) and occupation (OR = 0.431, $p < 0.01$) were also significantly but negatively associated with

willingness (Table 6). These findings may reflect time constraints or economic priorities among employed individuals or those in specific occupational sectors. La Barbera et al. (2018) observed that convenience and usability are key factors in the adoption of new food products. Additionally, the increasing humanisation of pets, as noted by Lei et al. (2019), may amplify considerations beyond cost, such as food quality and health outcomes, potentially discouraging adoption among certain groups.

Perceived benefits of BSFL were a strong positive determinant (OR = 3.474, $p < 0.001$), affirming the influence of health-related perceptions on consumer acceptance. Van Thielen et al. (2019) demonstrated similar trends in human diets, where nutritional value significantly drove interest in insect-based products. In the pet food sector, BSFL offers notable nutritional advantages, as highlighted by Kierończyk et al. (2018). Studies by Lei et al. (2019) and Seo et al. (2022) support its efficacy, with findings indicating improved health parameters and reduced serum cholesterol in dogs fed BSFL. Marketing and branding remain pivotal to influence consumers' perceived benefits. Kwak and Cha (2022) demonstrated that factors such as packaging aesthetics, perceived healthiness, and brand trustworthiness significantly shape consumer preferences. Given the increasing anthropomorphism in pet ownership, aligning product presentation with human food marketing strategies may enhance consumer engagement.

The palatability of BSFL to dogs is another facilitator of acceptance. Kierończyk et al. (2018) found that BSFL's scent was attractive to dogs,

while Valdés et al. (2022) reported that owners were more inclined to consider insect proteins when presented in processed forms. Despite such positive indicators, Duijnsveld (2022) observed that only 41% of pet owners in Belgium and the Netherlands were open to insect-based pet food, highlighting persistent consumer hesitancy.

Conversely, perceived risks had a significant negative effect (OR = 0.415, $p < 0.05$). Safety and health concerns are common barriers to the consumption of edible insects (Ghosh et al., 2017), and these concerns extend to pet food. Nonetheless, Kwak and Cha (2022) emphasised that consumer education significantly enhances willingness to

adopt insect-based diets. Additionally, Kierończyk et al. (2018) noted the potential hypoallergenic properties of insect proteins due to their novelty in pet diets, a feature that could be leveraged in targeted messaging.

Household size and education level were marginally significant at the 10% level ($p = 0.062$ and 0.075 , respectively). Larger households may face logistical or financial challenges in adopting novel pet food products. More educated respondents may be more open to BSFL, potentially due to greater access to information on sustainability and alternative proteins, consistent with trends reported by La Barbera et al. (2018).

Table 6: Determinants of Dog Owners' Willingness to Feed Their Dogs on Black Soldier Fly Larvae

WFBSL	Odds Ratio	Std. Err.	Z	P>z	[95% Conf. Interval]
County	6.909	3.444	3.88	0.000***	2.6004 18.355
Gender	0.667	0.2745	-0.99	0.324	0.2966 1.4936
Age	0.935	0.0160	-3.94	0.000***	0.9041 0.9668
Education level	2.846	1.6717	1.78	0.075*	0.9000 8.9992
Marital status	1.754	0.7136	1.38	0.167	0.7899 3.8933
Employment status	0.269	0.1411	-2.50	0.012**	0.0959 0.7519
Occupation	0.431	0.1390	-2.61	0.009***	0.2291 0.8108
Household size	0.890	0.0553	-1.87	0.062*	0.7883 1.0058
Average income	1.252	0.1946	1.44	0.149	0.9229 1.6977
Dogs owned	0.850	0.1019	-1.35	0.177	0.6724 1.0758
Dog vaccinated	0.652	0.6003	-0.46	0.643	0.1075 3.9599
Quantity of feed per week	1.047	0.0302	1.57	0.116	0.9889 1.1075
Cost of feed per week	1.000	0.0001	-1.51	0.131	0.9996 1.0000
Perceived benefits	3.474	1.287	3.36	0.001***	1.6820 7.1793
Perceived risks	0.4152	0.1546	-2.36	0.018**	0.2001 0.8615
Quantity of dog food per day	0.9996	0.0016	-0.23	0.818	0.9964 1.0028

Log likelihood = -103.9199, Wald chi2(16) = 105.11 Prob > chi2 = 0.0000

*: $p < 0.01$ **: $p < 0.05$, ***: $p < 0.001$

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study provides critical insights into the socio-demographic profiles, feeding practices, and

perceptions of dog owners in Nairobi and Kisumu counties, with a particular focus on their willingness to adopt Black Soldier Fly Larvae (BSFL)-based dog feed. The findings reveal that while processed food remains the most preferred type of feed due to

its convenience and perceived nutritional adequacy, a substantial proportion of owners still use leftovers and raw food—raising concerns about nutritional imbalances. Dog ownership in both counties is shaped by distinct demographic and socio-economic factors, with significant differences noted in gender, marital status, and occupation, but not in education level or employment status. Interestingly, vaccination practices appear to be uniformly adopted across both regions, while dog registration significantly varies—likely due to county-specific enforcement mechanisms.

Despite the potential of BSFL as a sustainable, nutritious, and cost-effective protein source for pet food, awareness among dog owners remains low. Over half of the respondents had never heard of BSFL-based dog feed, presenting a major barrier to its acceptance. However, those aware of BSFL were motivated by its nutritional value, the potential to improve dogs' health and appearance, and its relative affordability compared to conventional feeds. Logistic regression analysis revealed that younger dog owners and those perceiving clear nutritional benefits were significantly more willing to adopt BSFL-based feed. Conversely, age, employment status, occupation, and perceived risks reduced the likelihood of adoption, reflecting structural and perceptual barriers that need to be addressed.

The results underscore a growing openness among Kenyan dog owners—especially in urban areas—to innovative pet feeding solutions like insect-based ingredients, provided these are offered in processed and palatable formats. Previous research confirms that high-income, older pet owners are the primary buyers in the formal pet food market in Kenya, suggesting a ready market segment with both the means and motivation to adopt novel pet food products. Additionally, supermarkets remain the dominant point of purchase, highlighting the importance of ensuring visibility and availability of BSFL-based products through mainstream retail channels.

Recommendations

To fully unlock the potential of BSFL in Kenya's pet food sector, several policy actions are needed. First, robust public education and consumer sensitisation campaigns should be launched to demystify insect-based pet foods, correct misinformation, and build trust in their safety and health benefits. These campaigns should be complemented by targeted marketing strategies that emphasise convenience, cost-effectiveness, and pet health benefits, particularly to younger and high-income urban populations who show greater receptivity to innovation.

Second, public and private sector stakeholders should collaborate to develop and enforce clear standards for the production, processing, packaging, and labelling of insect-based pet food products. Regulatory clarity from agencies such as the Kenya Bureau of Standards (KEBS) and the Directorate of Veterinary Services will be essential to ensure product safety and consumer confidence. Simultaneously, incentives—such as tax breaks, grants, and training programs—should be offered to entrepreneurs and SMEs engaged in BSFL farming and processing, thereby supporting local production and job creation.

Third, veterinary professionals should be actively engaged in the promotion of BSFL-based pet feeds. As trusted advisors to pet owners, veterinarians can play a pivotal role in knowledge transfer and in validating the nutritional and health merits of insect-based diets. Equipping them with up-to-date scientific evidence will enhance their capacity to educate and reassure clients, particularly regarding food safety and long-term health impacts.

Fourth, manufacturers should prioritise the development of BSFL-based pet foods in processed formats (e.g., kibble, treats, or meal), which have higher consumer acceptance compared to raw or unprocessed insect-based options. Distribution should be optimised through retail chains,

especially supermarkets, to enhance product accessibility and drive market penetration.

Finally, continued investment in research is essential to build a robust evidence base on the long-term health effects of BSFL-based diets in dogs. Such studies will not only support regulatory approval processes but also inform the development of high-quality, evidence-based pet nutrition products. In the broader context, integrating BSFL production into Kenya's circular economy and climate-smart agriculture strategies can advance national goals on food security, waste reduction, and sustainable development.

Limitations of the Study

A potential limitation of this study was the presence of social desirability bias, particularly in responses to sensitive or personal questions, such as those concerning respondents' level of involvement with their pets, weekly expenditure on pet food, or household income. Although the questionnaire was carefully designed to minimise this bias, its influence cannot be entirely ruled out. Additionally, the measurement of pet food knowledge was based on respondents' self-assessed perceptions, representing subjective rather than objective knowledge. The survey items focused on aspects related to pet health and wellbeing; however, the reliance on self-reported understanding may not accurately reflect actual knowledge. This subjective evaluation could therefore limit the validity of conclusions drawn about the respondents' true level of pet food literacy.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Ethical Approval

The study was conducted within the scope of Jaramogi Oginga Odinga University of Science and Technology (JOUST) ethical provisions.

Data Availability Statement

The authors certify that the data used in this article was collected from the study and can only be availed by the corresponding author upon request.

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