

Research Application Summary

**Acceptance of insects as an alternative protein source for poultry feeds in Kenya**

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**Abstract**

Livestock feed prices in Kenya have been rising over the last decade with the increase in price being attributed to the cost of protein ingredients especially soybean and fish meal in the feed. Several interventions have been explored to reduce the rising cost of feeds which account for 60-70% of the total variable cost of production. One of the major potential interventions is the use of insects to replace the above ingredients in commercial feeds in order to reduce the costs associated with commercial proteins. Econometric results revealed that poultry farmers are willing to adopt insects as feed for poultry. It was therefore recommended that extension education should be strengthened to boost farmers' awareness of benefits of using insects.

Key words: Insects as feed, Kenya, Logit model, willingness to adopt

**Résumé**

Les prix des aliments du bétail au Kenya ont augmenté au cours de la dernière décennie, l'augmentation des prix étant attribuée aux prix des ingrédients protéiques, en particulier le soja et la farine de poisson dans les aliments. Plusieurs interventions ont été explorées pour réduire le coût croissant de l'alimentation animale qui représente 60 à 70% du coût variable total de production. L'une des principales interventions potentielles est l'utilisation d'insectes pour remplacer les ingrédients ci-dessus dans les aliments commerciaux afin de réduire les coûts associés aux protéines commerciales. Les résultats économétriques ont révélé que les aviculteurs sont disposés à adopter des insectes comme aliments pour la volaille. Il a donc été recommandé de renforcer l'éducation en matière de vulgarisation pour sensibiliser les agriculteurs aux avantages de l'utilisation des insectes.

Mots clés: Les insectes comme aliments pour animaux, Kenya, modèle Logit, volonté d'adopter

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**Introduction**

Poultry production is an important income generating activity for many rural households in Kenya. The sector contributes significantly to the country's Gross Domestic Product (GDP) while also acting as a major source of food security for households. Poultry is the most vibrant sub-sector of livestock production given the decreasing land sizes and the growing demand for poultry products which include meat, eggs, and feathers (Nyaga, 2007). Due to increase in population which has led to urbanization and shift of consumer dietary requirements, the demand for poultry meat has been rising (Abdullah *et*

*al.*, 2011). However, the poultry subsector has experienced several challenges with the high cost of feed driving some farmers out of production (Kingori, 2006). Feed ingredients such as maize, wheat, soybean and fishmeal are becoming expensive as there is increased demand for human consumption and the brewing industry (FAO, 2012b). The current production of poultry feed relies heavily on fish meal as a major source of protein ingredient in feed formulation (Liti *et al.*, 2006).

The Food and Agriculture Organization (FAO) estimates that 10% of the total global fish production is used as feeds ingredient; this creates competition with human consumption thus pushing the cost of the feed high thereby discouraging farmers from venturing into the sector (FAO, 2009). Ravindran and Blair (1992) argued that the survival of the poultry industry lies in its ability to compete with human consumption for the available food. Moreover, Gura (2008) argued that competition between feed and food as well as agro-fuels will likely force producers to look for cheaper and locally available feed sources.

Past studies have explored the possibility of replacing conventional protein sources with cheaper plant and animal protein sources. One potential solution is the use of insects as an ingredient for animal diets, primarily as an alternative to fishmeal, fish oil and soybean meal which face competition from human consumption (Makkar *et al.*, 2014; Henry *et al.*, 2015). Animal proteins such as insects have been found to be cheaper and possess high protein content as compared to plant sources (Sheppard *et al.*, 2008). Insects such as black soldier fly and house fly maggots have been commercially produced as a replacement for soybean meal in poultry feed (Veldkamp *et al.*, 2012).

## Methodology

**Study area and sampling techniques.** The study utilized cross sectional data collected from a random sample of 386 farmer households residing in Kisii county, Kirinyaga county and Nakuru county in Kenya. Data were collected using a house-hold level interview survey conducted during 2015 to obtain primary data on farmers' demographics, socio-economic characteristics, poultry production and marketing constraints, poultry practices as well as source of information on feeds.

**Theoretical framework.** The study is based on random utility theory which stipulates that, faced with a problem of choice, a rational economic agent chooses the option that maximizes his utility (Gourieroux, 1989). In literature, there are several models to analyze decisions to adopt agricultural innovations based on the law of ii including probit models (Benin *et al.*, 2004; Akinola and Owombo, 2012), logit models (Sidibe, 2005; He *et al.*, 2007) and tobit models (Adesina *et al.*, 2008; Mbetid-Bessane, 2010). This study employed the logit model due to its greater simplicity (Greene, 2011). Model structure representing farmer's decision to adopt or reject insect as feed is given by the following expression:

$$\Pr( Y = 1) = \frac{e^{\beta'x}}{1 + e^{\beta'x}}$$

Where Y is the dependent variable that takes on the value of 1 for the *i*th farmer who is willing to adopt insects as feed while 0 is for non-adoption while  $\hat{\beta}$ ' represents vector of parameters associated with X.

**Econometric findings and implications.** The factors influencing poultry farmer's willingness to adopt insects as feed are presented in Table 1. The most important determinant of willingness to adopt insects as feed for poultry was the previous experience on use of insects as feed by the farmers as well as availability of market for poultry and poultry products. Previous use of insects as feed increased the probability of a farmer willing to rear and use insects by 20% while selling point being a proxy to market availability decreased the likelihood of willingness to adopt by 19% since most of the market-oriented farmers heavily relied on commercial feeds for their livestock. This is consistent with findings reported by other studies (Alemu *et al.*, 2015; Megido *et al.*, 2016). Awareness by farmers that poultry feed based on insects had a significant impact on the willingness to adopt insects with farmers who had previous knowledge of insects being a source of feed for poultry more likely to rear and use insects.

Furthermore, access to extension services increased the likelihood of adoption of insects by 11 per cent while a unit increase in the number of family members had a 5 percent probability of farmers' adoption of the insects as feed. Awareness and perception of insects being used as animal feed were positively significant which is in line with previous findings (Verbeke *et al.*, 2003). The results of the study further indicated that farmers who had access to market information had a 14% higher likelihood of adopting insects as compared to those who did not access market information. Access to market information played a key role in farmers' decision to either sell or consume poultry and poultry products.

**Table 1. Socioeconomic factors influencing adoption of insects**

Variables	Robust		Robust	
	Coef.	Std. Err.	dy/dx	Std.Err.
Ever used insects as feed	1.601	0.412	0.196***	0.039
Aware that poultry feed on insect	1.343	0.469	0.268**	0.113
Household size	0.268	0.105	0.041*	0.017
Market information available	1.170	0.486	0.135*	0.043
New poultry technologies available	0.901	0.461	0.111*	0.046
Market availability	-1.454	0.343	-0.192***	0.042
Extension available	0.766	0.339	0.108*	0.046
Make own feed	0.767	0.529	0.098	0.055
Distance to feed supplier	-0.051	0.035	-0.008	0.005
Constant	-2.515	1.360		

\*\*\* Significant at 99% confidence level

### Conclusion and policy recommendations

From the results above, potential adoption of insects by poultry farmers is likely to succeed due to earlier experience when dealing with insects and individual farmer's awareness that poultry feed on insects. Therefore in order to promote insects' adoption as source of feed for poultry farmers, the stakeholders should emphasize on the benefits and potential cost reduction in using insects as compared to commercial feeds. Furthermore extension officers should perform a key role in educating farmers on how to make their own feed from the locally available resources rather than relying on the manufactured feeds. Due to high likelihood of insects' adoption by poultry farmers there is need to develop ways of mass rearing insects to satisfy the potential demand.

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