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Factors Influencing Smallholder Farmers Participation in Collective Marketing and the Extent of Participation in Improved Indigenous Chicken Markets in Baringo, Kenya

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Authors' contributions

This work was carried out in collaboration among all authors. Author EK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors CO and SW managed the analyses of the study and manuscript editing. The study was done under the supervision of author XG. All authors read and approved the final manuscript.

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ABSTRACT

Smallholder farmer collective action not only provides a solution to farmer's constraints such as lack of market accessibility and inability to take advantage of available market opportunities but also holds the potential to diversify their incomes and increase agricultural productivity translating to enhanced food security and poverty eradication. This research aimed at investigating the role of farmer marketing groups in smallholder market participation using a sample of 198 farmers, sampled from a population of 395 smallholder improved indigenous chicken farmers in Baringo, Kenya, using Probit and Tobit models. The study findings established that farmers' involvement in collective action is predominantly determined by; Education level, household size, distance to

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extension, cost of transport, and the price per chicken. The extent of participation in improved indigenous chicken markets was positively related to; education level of the household head and farm size while negatively and significantly influenced by off-farm income and the cost of farming. The results of this study provide evidence that farmer collective action has the potential of strengthening market participation among smallholder farmers.

Keywords: Chicken; farmer; participation; collective; market Baringo; Kenya.

1. INTRODUCTION

Markets and improved market access are vital in enhancing rural incomes, particularly in developing countries [1]. However, smallholder farmers have continuously faced a myriad of challenges emanating from commercial exploitation, majorly caused by poor market and information efficiency due to long market supply chains, and low returns [2]. Among the major constraints faced by smallholder farmers are high costs incurred in marketing and poor market access [3]. This is a reason why the Kenyan government and the private sector initiatives are supporting the formation and enhancement of collective action by farmers through the establishment of farmer marketing organizations to enhance market linkages in a bid to overcome the challenges faced by farmers.

Formation and enhancement of farmers' collective action have been reported to provide critical avenues where farmers can gain more utility from their farming activities. Farmers' participation in collective marketing can not only lead to superior bargaining powers in a value chain but can also reduce their transaction costs (through cost-sharing) and enhance their access to capital and information [4]. Farmer marketing organizations are viewed as a platform where farmers can gain bargaining power in the value chain, reduce their transaction costs through cost-sharing, and a mechanism to enhance access to capital and information [5]. Despite the potential benefits farmers receive from collective action, virtually a few farmers join the groups [6]. Agbonlahor et al. [7] reported that the level of commitments and the intensity among the participants vary due to their different motivations to join the groups and the perceived benefits from collective action. This depicts that there is more into farmer participation in collective action apart from membership decisions. Farmer's participation and the intensity of the involvement in collective action are important in enabling development practitioners interested in using collective action as a way to identify and assess the relevant services that benefit its members [6]. In their study, Shiferaw et al. [8], found that farmer participation in collective marketing decreased with per capita farmland, suggesting that farmers with small landholdings had a higher likelihood of participating in joint marketing. This is the reason why collective action is viewed as a breakthrough for resource-poor households in a bid to enhance their incomes and, thus, their welfare.

Despite the open benefits of collective marketing which include better prices, greater control of quality, and strong social capital, the majority of chicken farmers in Baringo County opt to market individually. It is not clear which factors influence farmers' marketing decisions as well as which factors contribute to increased participation in agricultural output markets. The main objective of this article, thus, is to investigate the extent to which farmer collective action affects participation in improved indigenous chicken markets by smallholder farmers in Baringo. The specific objective is to determine the influencing factors to farmers' marketing decisions, identify the factors that could contribute to increased participation in agricultural output markets, and make recommendations to support policy implementation.

The results of this study support the United Nation's goal 2.3 in the vision 2030 agenda for sustainable Development of ensuring the doubling of farmers' income through the provision of employment and market participation. The results generated from this study are useful in understanding the extent to which collective action affects participation in improved indigenous chicken markets by smallholder farmers in the study area. It is also helpful to policymakers in government and NGOs as it highlights whether corporate marketing can be used to improve indigenous chicken farming in Baringo County and the country at large. This study also adds to more insight into collective marketing of improved indigenous chicken markets. The findings of this research are useful to other researchers through the recommendations for further

research that have been made based on the findings.

1.1 Theoretical Framework

This research main argument was developed based on the utility maximization theory. Collective marketing is a marketing strategy that is adapted to achieve greater utility from farming activities. This strategy is used in maximizing such benefits as better bargaining powers, lower transaction costs, and better access to capital and information. Farmer's decision on whether to participate in collective marketing or not depends on whether through participating in collective action, a farmer receives a higher utility through group marketing as compared to individual marketing. Mercer, [9], notes that participation occasionally undertakes two stages; the decision to adopt or participate or not and the extent of adoption or participation.

The expected net utility that a farmer derives from participating in corporate marketing or not, given socioeconomic, demographic, and farm characteristics can be expressed as:

$$EU_iP = f(W_i) + e_i \quad (1)$$

$$EU_iN = f(X_i) + e_i \quad (2)$$

Where,

EU_iP represents the expected net utility of household i from participating in collective marketing, EU_iN is the expected utility for non-collective market participating household i . P represents collective action participating households whereas N represents non-participating households. X_i and W_i are the independent variables. e_i is the error term.

Farmer's expected utility will then be compared as depicted by Eq.3

$$Y_i = 1 \; if \; EU_iP - EU_iN > 0$$

$$Y_i = 0 \; if \; EU_iP - EU_iN < 0 \quad (3)$$

As shown by Eq. 3, the perceived expected utility from collective market participation is greater than the expected utility from non-participation for household i participating in collective marketing. Whereas the perceived utility for non-collective marketing participants derived from individual marketing is greater than the expected utility from participating in collective action.

2. MATERIALS AND METHODS

2.1 Study Area

The study area was Baringo County, located in the former Rift Valley province of Kenya and about 270 km North-West of the capital Nairobi, covering a vast land of 11,051.32 sq. Km. The county had a population of 666,753 [10].

The data used in this study was collected from Mogotio, Baringo County, Kenya, between the period of April and July 2019. A multistage sampling procedure was performed to select representative households from the study area. The first step involved the purposive selection of Mogotio sub-County, based on its potential of poultry production in the county comprising of six sub-counties. Improved indigenous poultry farmers were selected from the six wards of the sub-County using a random sampling method. The sampling frame in this study consisted of 395 households (Department of Agriculture, Baringo county). Based on Yamane [11], the sampling size was calculated to 198 households by using Eq. 1.

$$n = \frac{N}{1 + N(e)^2} \quad (4)$$

Where n is the sample size, e is the acceptable error term (5% or 0.05), and N is the population size for this study N was 395. Trained enumerators collected the data used in this study from the locality. This was in a bid to overcome the challenges in language and due to their familiarity with the region. Both primary and secondary data were used.

To determine the factors influence farmers' decision to participate in collective action and the extent of participation in improved indigenous chicken markets in Baringo county, two types of data analysis were performed, i.e., descriptive statistics and econometric modeling. The descriptive statistics analysis was presented in terms of means, percentages, ratios, and standard deviation to compare the socioeconomic, demographic, and farm characteristics of the sampled households. Probit and Tobit models were used in determining the factors that influence farmer participation in collective action and the extent of their involvement in improved indigenous chicken markets, respectively.

2.2 Determinants of Farmers' Participation in Collective Marketing

This study presents a correlation between collective marketing participation decisions and unobserved effects associated with the households, demographics, farm, and environmental characteristics. Due to the ordinal nature of the response outcomes, an ordered response model was applied in this study [12]. Additionally, due to the unobserved effects, the resulting degree of collective marketing participation decisions are ordinal in nature. Ordered Probit assumes normality and is invariant to the estimation difficulties associated with multinomial Probit models that are more preferred to ordered logit models [13].

Farmer's decision to participate in collective marketing was considered as a two-level ordinate response from joint marketing (yes/no). To calculate the effect of socioeconomic, demographic, farm, and household characteristics (dependent variables) on a farmer's decision to participate in corporate marketing. A propensity function or collective marketing participation decision function is defined according to Eq. 5.

$$Y^* = \beta^1 x + \varepsilon \quad (5)$$

Where $Y^*$is the unobserved propensity variable, β is the vector of the estimated parameters, x is the vector for independent variables. ε is the randomly distributed error term (assumed to be normally distributed with zero mean and unit variance). The ordered probit model can be expressed according to Eq. 6, based on the observed ordinal collective market participation data.

$$Y = \begin{cases} 0 & Y^* \leq 0 \\ 1 & Y^* > 0 \end{cases} \quad (6)$$

Eq.7 is then used to compute the probability of collective marketing participation for a given X [14], Provided that ε is normally distributed with a zero mean and a unit variance.

$$\Pr\,(Y = 0|1X| = \Phi(-\beta^{'}X)$$

$$\Pr(y = 1|X) = 1 - \phi\left(-\beta^{'}X\right) \quad (7)$$

Where ϕ (.) denotes the standard normal cumulative distribution function, $Y = 0$ indicates non (non-collective market participating households), $(y = 1|X)$ indicates yes (households that participate in collective marketing. Marginal effects were computed to uncover the direction effects where positive or negative is not clear. For continuous variables, the marginal effects were computed according to Eq. 5. However, for indicator variables, the marginal effects are calculated as the difference in the estimated probabilities with the indicator variables changing from 0 to 1 [13].

$$\frac{\vartheta(\Pr\,(y = 0)}{\vartheta X} = \Phi\left(-\beta^{'}X\,\right)\beta$$

$$\frac{\vartheta(\Pr\,(y = 1)}{\vartheta X} = \Phi\left(-\beta^{'}X\,\right)\beta \quad (8)$$

The model parameters were estimated using STATA 14 software. In this study, the fixed-parameter ordered Probit model was estimated.

2.3 Determinants of Farmer's Extent of Market Participation

Tobit model is a regression model with a dependent variable that can be either left or right censored [15]. In this study, the data was left-censored with clustering at zero because the extent of participation may not have been observed in all households during the observation. A Tobit model using a left-censored limit of zero can be expressed according to Eq. 9 [16].

$$Y^* = \beta^{'}X_i + \varepsilon_i, \qquad i = 1,2,3 \ldots . N \quad (9)$$

$$Y = \begin{cases} 0 & Y_i^* > 0 \\ 1 & Y_I^* \leq 0 \end{cases},$$

Where N is the sample size Y_i^* is the dependent variable, X_i is a vector of the independent variable. β is a vector of estimable parameters and ε_i is the error term (normally and independently distributed with zero mean and constant variance σ^2) From Eq. 6 above, there is an implicit stochastic index which is equal to Y^* which is observed only when positive. Thus, the corresponding likelihood function of the Tobit model can be expressed as shown by Eq. 7.

$$\mathrm{LL} = \prod_0 \left[1 - \Phi\left(\frac{\beta X}{\sigma}\right)\right] \prod_1 \sigma^{-1}\,\Phi\left(Y_i - \frac{\beta X}{\sigma}\right) \quad (10)$$

Where Φ is the standard normal distribution function Φ is the standard normal density function (for review, please refer to [17]. Table 1 presents the description of the variables used in this study.

Table 1. Description of variables used in empirical models and a prior expectation

Variables	Description	Measurement	Sign
	Dependent variables		
Prob (Y)	Type of household (Collective action participant/ non-participant	Dummy (1=participant, 0=non-participant	+/-
Extent of participation	Number of chickens sold in the market	The proportion of chicken sales	+/-
	Independent variables		
Age	Age of household head	Age in Years	+/-
Gender	Gender of the household head	1=male, 0=female	+/-
Education	The education level of household head	Education level (continuous)	+/-
Credit access	Household's accessibility to credit	1=yes, 0=no	+
Farm size	Total land owned by household	Acres	+/-
Cost of farming	Cost of poultry production	Ksh	+
Cost of bargain	Cost incurred during bargain	Cost in Ksh.	-
Flock attributes	Flock characteristics	Number of attributes	+/-
Off-farm income	Engagement in off-farm activities	1=yes, 0=No	+
Market distance		Kilometers	+
Extension distance	Distance to the point of sale	Kilometers	+
Cost of information	Distance to extension services Cost of information	Aggregate cost of information	+

2.4 Justification for Inclusion of Hypothesized Variables

2.4.1 Age of household head

Age was employed in this study as a proxy measure of farmer's experience in production and marketing as a continuous variable. A study by Mutayoba and Ngaruko, [18] and Barrett, [19] found a negative relationship between farmers' market participation, whereas Asfaw et al. [20], presented a positive relationship. With this evidence, age was thus hypothesized to have an indeterminate relationship with market participation.

2.4.2 Market distance

The market distance was captured as a continuous variable measuring the distance between the farm and the poultry market where the farmers sell their produce. The poultry products are mainly transported using bicycles, motorcycles (Commonly known as bodaboda). Previous work by Lwezaura and Ngaruko, [21], noted that distance had a positive relationship with collective marketing. Findings by Makhura et al. [22], presented that market distance influences both market participation and the volume of output sold.

2.4.3 Average price per chicken

The average price per chicken was included in the analysis as a continuous variable in Ksh (Kenyan shillings). Higher market prices paid to farmers enable farmers to produce more and thus increased market participation. Findings by Omiti et al. [23], presented a positive relationship between farmer market participation and their volume of sales.

2.4.4 Education

The education level of the household head, indicating the number of years a household head spent in formal education, was also used as a continuous variable. Previous studies on participation in markets have noted a positive relationship between farmer's level of education and participation in markets. This has been attributed to the fact more education translates to better farming practices, better negotiation, and contractual skills [24,25]. Education was thus hypothesized to explicit a positive relationship with farmer participation in collective marketing and the extent of participation in improved indigenous chicken markets.

2.4.5 Household size

Household size was included in the regression as a continuous variable capturing the number of

members in a household. Previous research has depicted household size as portraying an indeterminate relationship with household participation markets and volume of sales. Studies by Alene et al. [26] presented that household size had a positive relationship with the volume of market sales, noting that the volume of labor supplied was greater than the volume of marketed output.

2.4.6 Gender

The gender of the household head was captured as a dummy variable depicting the sexual orientation of the household head. Previous studies have presented differing findings on the role of gender in participation in collective marketing, market participation, and the extent. Findings by Mutayoba and Ngaruko, [27], noted that male-headed households had a higher probability of taking part in markets. Similar results were presented by [18]. The gender of the household head was thus hypothesized to have an indeterminate influence on farmer participation in collective action and the volume of sales in markets.

2.4.7 Farm size

Farm size was captured as a continuous variable depicting the extent of land owned by the household. Farm size is generally expected to have a positive relationship with market participation. Findings by Olwande et al. [28] presented that farm size may have an indirect impact on market participation since it is often used as collateral for credit that is used in enhancing production.

2.4.8 Off-farm income

Off-farm income in this study was included as a continuous variable indicating farmer's income from other undertakings apart from farming. Farm income was hypothesized to have a negative impact on participation in corporate marketing and volume of sales, an indication of household income diversification [29].

2.4.9 Cost of information

The cost of information was captured as a continuous variable in Kenyan shillings (Ksh), presenting the cost incurred by farmers in accessing market and production information. The cost of information is hypothesized to have a positive relationship with the farmer's participation in collective marketing. This is because farmers pull together to cut costs.

2.4.10 Credit access

Credit access was hypothesized to have a positive influence on the extent of farmer participation in markets. Randela et al. [30] noted that access to resources such as credit and market information increased decision-making ability.

3. RESULTS AND DISCUSSION

3.1 Descriptive Statistics of Variables

Farmers decision to participate in collective action, their determinants of participation and extent of participation in improved indigenous chicken markets are influenced by several socioeconomic factors including; cost of farming, highest level of education of household head, off-farm income, household size, age, market distance, distance to extension services, access to credit, average price per chicken sold, road type, cost of transport, cost of transportation, gender of household head and cost of information. Table 2 gives a presentation of the descriptive categorical variables used in the study, with Table 3, presenting the descriptive statistics of continuous variables.

3.1.1 Interpretation and discussion

On the issue of the gender of the household head, the results of the study showed a huge disparity in the distribution of males and female, as shown in Table 2. About 73.2% were males while 26.8% were female. This may imply that farming and marketing-related decisions such as participation in collective marketing and the extent of participation in improved indigenous chicken markets may be dominated by the male gender.

Majority of the interviewed households were not members of agricultural groups as shown by 72.7% of the total households. It was just 27.3% of the sampled households that belonged to groups. As a social capital, group membership is very crucial in solving common challenges that farmers face in their various activities.

The majority (72.2%) of the household heads were married, implying that most of the farming activities may have been targeted to benefit a number of household members. However, some of the household heads were single (19.2%), while a few were widowed (6.1%), divorced (2.0%), or with other marital statuses (0.5%).

Table 2. Descriptive statistics results for categorical variables

Variables	Categories	Frequency	Percent
Gender of the Household Head	Female	53	26.8
	Male	145	73.2
	Total	198	100.0
Participation in Groups	Non-Member	144	72.7
	Group Member	54	27.3
	Total	198	100.0
Marital Status of the respondents	Single	38	19.2
	Married	143	72.2
	Divorced	4	2.0
	Widowed	12	6.1
	Others	1	.5
	Total	198	100.0
Age of household head	18-30 years	4	2.0
	31-40 years	22	11.1
	41-50 years	99	50.0
	51-60 years	61	30.8
	Above 60 years	12	6.1
	Total	198	100.0
Highest Level of education completed	None	20	10.1%
	Primary	43	21.7%
	Secondary	70	35.4%
	College	27	13.6%
	University	38	19.2%
	Total	198	100.0%
Household size	1-3 members	48	24.2%
	4-6 members	106	53.5%
	7-9 members	40	20.2%
	10 and above members	4	2.0%
	Total	198	100.0%
Type of Household	Non-Market Participant	64	32.3
	Market Participant	134	67.7
	Total	198	100.0
Ownership of chicken the past one year	Yes	189	95.5
	No	9	4.5
	Total	198	100.0

Source: Field Survey data 2019

Table 3. Descriptive statistics results for continuous variables

Variable	Observations	Mean	Standard deviation
Cost of Transport	198	1,270.69	109.85
Cost of information	198	9,124.62	317.95
Bargain cost	198	358.08	73.43
Off-farm income	198	27,777.78	6,640.85
Average price per chicken	198	944.19	63.54

Source: Field survey data 2019

The majority (50.0%) of the household heads were aged 41 - 50 years. About 30.8% of the household heads were aged 51 - 60 years, while 11.1% were aged 31-40 years. There were very few household heads aged above 60 years (6.1%) and 18-30 years (2.0%), as shown in Table 2.

The level of formal education plays a significant influence on farming. The majority (35.4%) of the farmers had a secondary level of education. About 21.7% had primary, 13.6% had college, while 19.2% had university level of education. However, 10.1% of the farmers had no formal education.

The majority of the households (53.5%) had 4 - 6 members. About 24.2% had 1 – 3 adult members, while 20.2% had 7 - 9 members. It was a minority (2.0%) of the households who had 10 members or more. The size of the household influences the expenditure on food and availability of family labor. This implies that most households could benefit from adequate family labor in their farming activities.

This study was interested in whether the sampled households participated in the market or not. The results show that the majority of the households involved in markets as represented by 67.7% of the households. However, about 32.3% of the households did not participate in the improved indigenous chicken market.

This study noted that an overwhelming majority of the households in the study area owned chicken during the past year (Table 2). This confirms the popularity of improved indigenous chicken farming in the study area.

The results in Table 3 shows that sampled farmers in the study area spent an average of Ksh. 120.69 on transport (with a standard deviation of 109.85), Ksh. 9,124.62 on information search (with a standard deviation of 317.95) and Ksh. 358.08 on bargaining (with a standard deviation of 73.43). An average household had an off-farm income of about Ksh. 27,777.78 (with a standard deviation of 6,640.85). The average price of chicken that households received Ksh. 944.19, with a standard deviation of 63.54.

3.2 Factors Influencing Farmer's Decision to Participate in Farmer Marketing Groups (Collective Marketing)

A probit model was used in analyzing the determining factors affecting farmer's participation in group marketing. From Table 4, it is observed that the log-likelihood ratio statistics, as presented by the Chi2, are statistically significant ($p<0.0000$). This indicates that all the parameter models were jointly significant in describing the dependent variable. It was observed that farmer's decision to participate in corporate marketing is influenced significantly by Education level, household size, distance to extension, cost of transport, and the price per chicken.

The education level of the household head had a positive effect on a farmer's decision to participate in collective action. An increase in the level of education of farmers enables them to access better market information and new opportunities for the commodities produced. This is advantageous to their groups through widened market opportunities for their produce. The findings concur with those of Olwande et al. [28], whose study noted that education enabled farmers to utilize market information, thus, lowering the transaction costs, hence, increased market participation.

The size of the household had a positive and significant effect on farmers' decision to participate in collective action. This explains that the more the members of a household, the higher the probability of participating in collective marketing. With the high expenditure need for food and other items by bigger households, the need for creativity and knowledge acquisition increases a reason why they may opt to participate.

Credit access had a positive impact on a household's decision to participate in collective action. An indication that farmers who accessed credit had a higher probability to engage in joint marketing a factor that can be explained by the role of credit in enhancing farmer linkages to networks that improve access to information, technology, and inputs as observed by [31].The findings are consistent with those of Fischer and Qaim, [32], whose results noted that credit access had a positive relationship with a farmer's decision to participate in collective action.

The distance to extension services had a positive influence on the household's decision to participate in collective action. An increase in the distance to extension services was observed to increase the probability of farmers to join improved indigenous chicken marketing groups, as shown in Table 3. This can be explained by the need to reduce the cost of accessing extension services by farmers having themselves in groups and access the services of extension officers collectively through such activities as field days and demonstrations as compared to each farmer undertaking it alone. The effect can also be explained by the need of farmers to improve their need to enhance their access to quality information on markets and better opportunities on markets. The findings are consistent with those of Simon et al. [33] and Fischer and Qaim, [32], whose studies found that farmer's distance to extension services had had both financial, time and information access implications.

Table 4. Probit model results for factors that influence participation in collective marketing

Variables	Coefficient	Std. Err.	z	p>|z|
Age	-0.0311632	0.1448128	-0.22	0.830
Education	0.4974528***	0.1052542	4.73	0.000
Household size	0. 0955818 **	0.0536469	1.78	0.075
Credit access	0.6536922*	0.3167296	2.06	0.039
Farm size	0.0676123	0.0971848	0.70	0.487
Distance to extension	0.1915676 ***	0.0506732	3.78	0.000
Cost of transport	-0.0025553**	0.0009483	-2.69	0.007
Cost of information	0 .0000405 *	0.0000189	2.15	0.032
Off-farm income	1.69e-06	4.70e-06	0.36	0.719
price per chicken	0.0001677 **	0.0000709	-2.37	0.018
Constant	-2.140539	0.6819622	-3.14	
LR chi2(11) = 58.38				
Prob > chi2 = 0.0000				
Log likelihood = -95.406741				
Pseudo R2 = 0.2343				

****Significant at 1%, **5% and *10%*

Table 5. Tobit model results for determinants of farmer's extent of participation in markets

Variables	Coefficients	Std. Err.	t	P>|t|
Age	2.72645	2.447721	1.11	0.267
Gender	1.766699	4.293448	0.41	0.681
Education level of household head	6.608227 ***	1.550613	4.26	0.000
Group membership	1.514982	4.421345	0.34	0.732
Farm size	2.642286 **	1.59081	1.66	0.098
Off-farm income	-0.0002617 ***	0.0000844	-3.10	0.002
Cost of farming	-0.014239***	0.0044662	-3.19	0.002
Cost of bargain	-0.0027782	0.0258057	-0.11	0.914
Cost of transport	0.0122009	0.0169775	0.72	0.473
Aggregate cost of information	0.0000461	0.0001957	0.24	0.814
Extension distance	-0.0999339	0.6190636	-0.16	0.872
Constant	50.73849	25.8722		
Sigma	24.3823	1.578514		
Number of obs. = 198				
LR chi2(12) = 52.77				
Prob > chi2= 0.0000				

****Significant at 1%, **5% and *10%*
Source: Field Survey data 2019

The cost of information had an insignificant positive effect on farmers' decision to participate in collective action. The results showed that farmer participation in collective action increased with an increase in the cost of information, a factor that can be attributed by the need to pull together to enhance access to quality information on market dynamics, production, and new opportunities available for the farmers.

The average price per chicken received by farmers from selling their birds was significantly and negatively related to farmer's participation in corporate marketing. This is attributed to the fact that higher prices translate to higher returns from the venture and thus farmers ability to market their products independently increases.

3.3 Estimation of Factors Influencing Market Participation and the Extent of Farmer Participation in Improved Indigenous Chicken Markets

The Tobit model was used to evaluate the extent of farmer's participation in chicken markets. From Table 5, it can be observed that the likelihood ratio statistics, as presented by Chi2, are highly statistically significant (P<0.0000). Thus, the model had a high descriptive power in describing the dependent variable. From the results,

Farmers' extent of market participation in chicken markets was significantly influenced positively by the education level of the household head and farm size while negatively and significantly influenced by off-farm income and the cost of farming.

The education level of the household head positively and significantly increased the intensity of farmer participation in the market. This implies that as a farmer spends more years in formal education, he/she is better placed to identify opportunities in markets, market dynamics, and enhanced access to market information. The findings mean that the education of household heads is vital in enhancing market participation rate since it enhances access to acquisition of new techniques and ideas on agricultural production, translating to increased production and thus increase in market supply. The findings were consistent with those of Lubungu et al. [24], whose study noted that education is a factor that enhances understanding of market dynamics and thus leads to informed market participation decisions.

Farm size was observed to positively and significantly influence the extent of farmer's participation in chicken markets. This is because farmers with larger parcels of land are better placed to not only rear more chicken, but can also produce feeds from the farm to feed their chicken. This translates to increased production, which enhances farmer's participation in markers. The findings are similar to those of Edward et al. [34], whose study on the commercialization of agriculture in Ghana noted that farmers' extent of participation in markets increases with the size of land owned.

Off-farm income negatively influenced the extent of farmer participation in improved indigenous chicken markets. The findings were contrary to the expectation and thus implies that farmers in the study area did not invest their off-farm proceeds on improving farm activities but rather on other activities besides farming. The findings concur with those of Edward et al. [34] who noted that there was a negative relationship between farmer off-firm income and agricultural commercialization.

The cost of farming was observed to have a negative effect on the extent of farmer's participation in improved indigenous chicken markets. The negative relationship implies that an increase in the cost of farming reduced the level of improved indigenous chicken production as farmers will opt to invest in other agricultural ventures whose production costs are relatively lower.

4. CONCLUSION AND RECOMMENDATIONS

The marketing of agricultural products plays a significant role in enhancing the attainment of the overall goals of sustainable agriculture, food security, employment creation, and poverty eradication, especially among rural smallholder agricultural farmers. This study aimed at evaluating the role of farmer collective action in enhancing market participation among smallholder improved indigenous chicken farmers. The critical issues investigated were; the determinants of collective action and the factors that influence the decisions of farmers to participate in improved indigenous chicken markets and the extent of participation (number of chickens sold). A variety of factors influenced farmers' decision to participate in corporate marketing, including education level, household size, distance to extension, cost of transport, and the price per chicken. The extent of farmer's participation in improved indigenous chicken markets was significantly influenced by; the cost of farming, off-farm income, education level of the household head and market distance. For better participation in corporate marketing, less educated farmers should be supported to gain necessary skills for improved indigenous chicken farming and marketing through training and better link to extension services. The government should also endeavor to improve the road infrastructure in the study area to contain the high costs associated with transport, which is a great hindrance to the value chain upgrade. For more significant participation in improved indigenous chicken markets, farmers should be supported and empowered to deal with pertinent issues such as the cost of farming, livelihood diversification, and skills gap. Carefully designed intervention strategies on the part of the government and other stakeholders (NGOs and farmers organizations).

5. POLICY IMPLICATIONS

Collective marketing has the potential to transform the rural economy through employment creation, income generation and, consequently, eradication of food insecurity. A clear policy that aims at supporting local organizations and promoting smallholder farmer's collective action taking into

consideration the heterogeneity characteristics of farmers is urgently needed. Enhancement of rural education and also infrastructural facilities are vital in enhancing the success of collective farmer marketing. The National and the County government should not only enact policies for the smallholder farmers but also implement and manage them in an appropriate way to improve corporate marketing in Baringo County.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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