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Analysis of Institutional factors Influencing Farmer's Choice of Milk Marketing Channel in Rwanda

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Abstract: ***Despite the importance of formalization of milk market in Rwanda, the majority of dairy farmers are continuing to choose to market their milk using informal channels at 63% at country level. Farmers are obviously supposed to be rational in their decision making but it is not clear what drives farmer decision of the channel to sell to. This study investigated institutional factors affecting farmer's choice of milk marketing channel in Nyabihu District, Western Province of Rwanda. Multistage sampling techniques were employed to select respondents. Data was drawn from 96 respondents using structured questionnaires. Multinomial Logit regression model was employed to estimate the data. The results from the model show that form of payment (P≤0.01) influenced negatively the choice of local vendors marketing channel over brokers channel and contract farming (P≤0.01) greatly influenced positively the choice of local vendors marketing channel over brokers channel. One the side The results indicated that form of payments(P≤0.05), access to market information(P≤0.10) affect negatively the probability of choosing milk collection centers marketing channel over brokers channel and access to credit(P≤0.01), awareness of milk quality (P≤0.01)and contract farming (P≤0.01) are positively influenced the choice of milk collection centers compared to brokers channel. Further the study recommends government funding to be increased to make those institutions more active so that it can facilitate in providing trainings and the right information to dairy farmers. Provision of non-price incentives and promoting transparency and accountability in the governance of milk collection centers and dairy cooperatives are to be reinforced in order to attract more farmers in formal value chain. Lastly, a broader study to cover more districts in Rwanda can be conducted to confirm whether the same results apply.***

Key words: ***Choice of milk marketing channel, Smallholder's dairy farmers, Multinomial Logit model, Nyabihu District, Rwanda***

I. INTRODUCTION

First and second Sustainable development goals pledge to end poverty and hunger in 2030 and this should not be achieved without emphasizing on market access of agricultural products and handling challenges that face rural farmers in their marketing decision. Dairy sub sector is tremendously increasing in production from 2008 to 2013 an increase of 89 millions tones globally (CNIEL, 2014) whereas developed countries are the major dairy suppliers on the world market because of broad-based use of modern farm and processing technologies with well structured marketing channels. African continent have only 6% of share in the world dairy trade with a big number of livestock (Guadu,T. &Abeba,M. 2016). The formal value chains generally channeled about 15% of the milk output sold in eastern African countries (Bingi&Tondel.2015) and the cooperative is the most used structure for milk marketing.

Rwandan dairy sub sector is estimated to contribute about 6% of the total GDP and 15% of total agricultural gross domestic and is the fastest growing sub-sector within agriculture. Milk marketing channels in Rwanda are categorized into two channels/systems: a commercial system (CS) involving milk collection through a cold chain where quality assurance can be maintained; and an alternative marketing system (AMS) mainly involving informal milk collection and trade where no systems are put in place to ensure quality standards are maintained and subquently affect farmers by only selling morning milk and wastages increase. Heifer International (2016) cited by MINAGRI (2016a) recently has revealed that 46.1% of milk is not marketed and 53.9% of milk is marketed with 63% of farmers using informal channels and 37% using formal channels. Dairy farmers are facing marketing decision challenges on where to sell to and this is influenced by high transaction costs related factors including lack of access to market, poor road infrastructure, market information, spoilage of milk, and high transport cost and subsequently results into a weak market

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access. Dairy farmers prefer to sell their milk yield to vendors who pay them in cash rather than those who pay them on monthly basis because their payment are irregular and takes a long time (MINAGRI, 2013).

Transactions costs have been enumerated as the key factor for smallholder farmers' failure to participate in the markets by Barrett, (2008). According to Makhura,(2001) and Pingali et al.,(2005) the farmers take a marketing decision to sell a certain quantity of milk when they balance the transaction costs that may affect farm gate prices where the welfare gains are at certain positive level. Kabeto (2014) study argued that farmers who are members of cooperatives are likely to reduce the transaction costs related to transport, market information and thus could participate and choose to supply milk to formal channel than non-members.

Marketing channel decisions are among the most complex and challenging decisions facing farmers and chosen channels intimately affect all other marketing decisions (Kotler et al., 2004). Rwandan government put in place milk marketing formalization policy through a new Ministerial Order regulating the collection, transportation and selling of milk (MINAGRI, 2016b) that seeks to improve the quality of traded milk and ensure the maintenance of minimum food safety standards in the sub sector and currently, only about 10 – 15% of traders meet the conditions laid out in the new regulation but the majority of dairy farmers in Rwanda are continuing to choose to market their milk using informal channels at 63% at country level (MINAGRI, 2016a). MINAGRI (2016a) in Rwanda and Kadigi (2013) in Tanzania studies found that formal channels operates at a lower percentage which was supposed to provide farmers' interests.

Economists argue that choices are induced by rational preferences and constrained by resource scarcity, opportunity costs, institutional norms and quality of information, among others; (Kotler et al., 2004). However profit should guide farmer's choice of market channel, yet this is often not the case; it is not clear what drives farmer decision of the channel to sell to. Therefore studies on factors affecting the choice of milk marketing channel in Rwanda are few and hence innovations in marketing are also needed. Understanding institutional factors affecting farmer's choice of milk marketing channel in Rwanda is an important opportunity to increase smallholder farmer incomes.

II. METHODOLOGY

A. *Study Area*

Nyabihu district is one of the 7 districts of the Western Province of Rwanda. The District has an overall area of 512.5 km^2 and has a population of 295,580 inhabitants with 46.7% men and 53.3 % of women for a density of 556 persons per square kilometer and also has an illiteracy rate of 31.6% (EICV3, NISR, 2011). According to the EICV3, livestock farming in Nyabihu District is distributed among cattle (45.4%), goats (38.4%), pigs (6.3%. and chicken (34.6%) with 24087 households owning cattle with approximately 39 440 cattle in the District with 2719 Cows from Girinka Program. Nyahihu has 25 dairy cooperatives with 1294 members , Eight agro-vet pharmacies , four(4) working Milk Collection Centers , a new Mukamira Dairy factory and five(5) cheese making Small Medium Entreprise (SME). Dairy Marketing in Nyabihu is dominated by informal channel , selling in restaurants, selling abroad by brokers to Rubavu town and Goma in DRC (Nyabihu District Officials) and a big quantity are lost and consumed at home because of lacking direct market and chilling equipments as 9.73% households are only connected to Electricity (EWSA reports, 2013 cited by Nyabihu District report,2013). Nyabihu district was selected purposively because of milk production potential and the existing low farm gate prices and this district considers milk as a strategic commodity that can help to increase the district revenue and farmers' income.

B. *Sampling Plan*

The target population of the study was 16115 dairy cattle farmers of Nyabihu district. Multi-stage sampling procedure was used in order to draw a sample from smallholder dairy farmers. The first step involved purposive selection of 6 sectors among the twelve sectors in Nyabihu District namely Mulinga, Mukamira, Jenda, Bigogwe, Rambura and Rurembo sectors mainly because they are the main milk producing sectors in Nyabihu district as they have a share part of Gishwati cattle ranches. Finally, 16 farmers were interviewed in each sector using simple random sampling with the help of the sector veterinaries which gave a total sample of 96` farmers.

$$n = \frac{z^2pqN}{e^2(N-1)+z^2pq}$$ Kothari (2004)

Where: *n*: is the sample size for a finite population; N: size of population which is the number of households with at least one cattle; p: population reliability (or frequency estimated for a sample of size n), where p is 0.5 which is taken for all developing countries population and p + q= 1; e: margin of error considered is 10% for this study. Z: normal reduced variable at 0.05 level of significance z is 1.96. According to the above formula, the sample size is:

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$$n = \frac{1.96^{2} \times 0.5 \times 0.5 \times 16115}{(0.1)^{2}(16115-1) + (1.96)^{2} \times 0.5 \times 0.5} = 95.746 \approx 96$$

C. Data Analysis

Data were entered into computer software for analysis. Epidata Version 3.1 and SPSS version 16 was used to record the questionnaire and process descriptive statistics and STATA Version 13 was used to analyze inferential statistics. The study used Multinomial Logit model in order to analyze institutional factors affecting smallholder farmer's choice of milk marketing channel in Nyabihu district; the choice of marketing channel is fundamental and important decision for the farmers where factors and conditions have to be considered as a basic for precise decision.

D. Model For Dairy Farmer's Milk Market Channel Choice

In our study multinomial Logit model was used to estimate the probability of individual i choosing a marketing channel j (Brokers, Local vendors, MCC) subject to household, institutional and market factors. The model explaining the probability of a given milk marketing channel to be used is shown in equation 1 below:

$$Prob(Y_i = j) = \frac{e^{\beta_j x_i}}{\sum_{k=0}^{J} e^{\beta_j x_i}}, \quad j=0,1,2\ldots.J \qquad (1)$$

Where, for Y_i = Probability representing the i^{th} farmers choice of market channel j. X_i= is the vector of explanatory variables. β_j=is a vector of coefficients on each of the independent variables X_i

A positive estimated coefficient implies an increase in the likelihood that a dairy farmer choose the alternative marketing channel. A negative estimated coefficient indicates there is less likelihood that farmers change to an alternative channel.

The empirical specific is simplified as presented in equation 2 below

$$\pi_{ij} = \beta_0 + X_i \beta_j + \varepsilon_{ij} \qquad (2)$$ Where:

π_{ij} =Probability that dairy farmer i chooses to market milk through channel j; β_0 = Constant term, X_i = Dairy farmers' household, institutional and market factors

β_j = Parameters to be estimated, ε_{ij} = Error term

III. RESULTS AND DISCUSSION

A. Categories Of Milk Marketing Channels

Different categories of marketing channels were defined and analyzed in order to identify categories of buyers. Forty nine percent (49%) of farmers under study sold milk to brokers while 36% sold tolocal vendors and 15% sold to milk Collection centers as illustrated in Figure 1.

At the time of data collection, farmers were allowed to sell everywhere without any influence and the new Ministerial Order on milk collection, transportation and marketing (MINAGRI, 2016b) was not yet put in place. The results indicated that the majority (85%) of respondents sell their milk in informal channels and minority of (15%) use formal channels. These results can be explained by the fact that they were four milk collection centers, only in four sectors out of six sampled so farmers said that they used to sell to brokers and Local vendors because of the long distance to MCC and refusal of milk due to low quality and spoilage, failure of contract, and payment model used. There are also varied reasons for farmers who sold to MCC such as high price as their main motivation when selecting market channel and the provision of services such as getting inputs on credit and trainings.

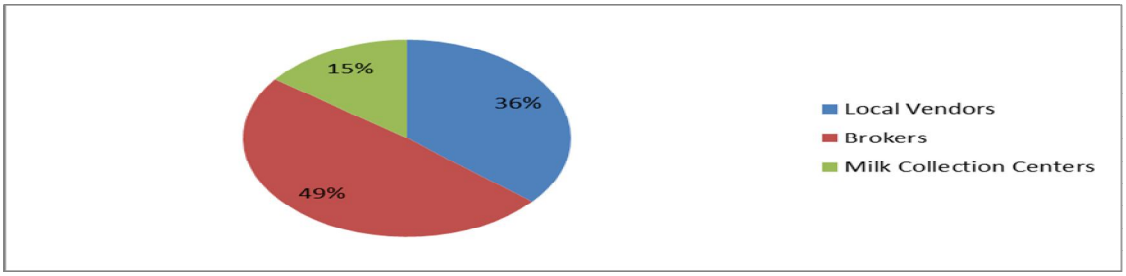

figure 1: distribution of different milk channels available

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This result corresponds to the study of Sikawa and Mugisha (2013) conducted in Southern-Western province of Uganda showed that majority of farmers prefer informal channels (73.3 %) because low transaction costs involved , advance payments among others. It is also in line with Heifer International Rwanda (2016) study cited in MINAGRI (2006a) that majority of dairy farmers in Rwanda sell their milk in informal channels at 63% at country.

B. Econometric Analysis Of Institutional Factors Affecting Dairy Farmers' Choice Of Milk Market Channel

Form of payments was negatively and significantly influenced in accessing local vendors and MCC channels compared to the brokers channel. The reason behind these results were that farmers preferred to join brokers as a channel of getting advance payments than local vendors and MCC channels. This result is in harmony with Sikawa and Mugisha (2013) study indicated that households were more likely to select channels that paid cash compared to channels that offered monthly payments to the reason of financial obligations and instability (unsecure).

In this study, Contract farming was positively and significantly related to choose of local vendors and milk collection center channels over brokers at 1 percent level of significance. These results can be explained by the fact that written contracts and monthly payments often used to go hand in hand as farmers using contract trust and believe the buyers and have security of their market channels rather than brokers channel. Farmers who were aware of milk quality had a positive and significant influence on the farmers' choice of milk marketing channel.

Table 1. Institutional factors affecting smallholder's dairy farmers' choice of milk market channel

Market chosen	Coef.	Std. Err.	Z	P>|z|	dx/dy
Local vendors					
Access to market information	0.38	0.73	0.53	0.597	0.079
Cooperative membership	-1.72	1.182	-1.46	0.146	-0.012
Exposure to Extension services	-0.43	0.68	-0.62	0.534	0.146
Access to credit	0.24	0.91	0.26	0.792	-0.001
Costs incur during marketing	-0.62	0.96	-0.63	0.526	0.126
Aware of milk quality	0.264	0.64	0.41	0.683	0.037
Contract marketing	2.42	0.68	3.52	0.00***	0.059
Form of Payment	-1.15	0.47	-2.42	0.016**	-0.032
Constant	0.91	1.321	0.69	0.488	0.122
Milk collection Center					
Access to market information	-1.98	1.162	-1.7	0.088*	-0.349
Cooperative membership	-1.32	-1.3	-1.11	0.267	-0.104
Exposure to Extension services	1.36	1.32	1.02	0.306	0.026
Access to credit	40.5	1.36	29.81	0.00***	0.007
Costs incur during marketing	0.037	1.344	0.03	0.978	0.126
Aware of milk quality	17.95	1.25	14.31	0.001***	0.213
Contract marketing	19.3	1.245	15.52	0.00***	0.054
Form of Payment	-1.16	0.52	-2.23	0.025**	-0.223
Constant	-15.88	0.911	-17.44	0.03***	-0.045

Base category is brokers; Asterisks denote the level of significance * = 10%, **5% while ***is 1%. Number of observations = 96 Wald chi2(38)=8531.89 Prob> chi2=0.0000 Log pseudo likelihood = -21.4813 Pseudo R2 =0.7804

Awareness of milk quality increases the likelihood of dairy farmers to choose milk collection centers channel over brokers channel. This results can be explained by existing obligations of selling milk in the MCC before milk quality testing; so farmers who were not aware of the quality of milk encountered many problems of getting a low price and even rejecting their milk produces. The results (Table 1) shows that there was a negative relationship between choosing of milk Collection centers and access to market

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information at significance level of 10 percent. This relationship is likely due to the degree of satisfaction towards leadership commitment (Accountability &Transparency) of the Milk Collection Centers which still unbelievable. However, the results conflict with findings of other studies who reported that access of information is positively associated with using Milk collection centers (Mekonin 2015; Mesfin, 2017)

Access to credit was positively and significantly increases the probability to choose milk collection centers channel compared to brokers channel by the fact that farmers who were selling milk through milk collection centers had access to credit. The research finding support the results of Kadigi (2013) who revealed that access to credit help farmers to get loans that could assist them in expanding their scale of operation.

IV. CONCLUSION AND RECOMMENDATIONS

The results of the study confirmed that institutional factors identified were access to market information, access to credit, aware of milk quality, contract marketing and form of payment and the study concludes that institutional factors are key factors in the choice of milk market channel.

The study recommended that policymakers should put in place feasible strategies to support the existing ministerial order regulating milk collection, transportation and selling; Increasing Milk collection centers and provision of non-price incentives in those centers; trainings on milk quality and standards and best animal husbandry practices should be reinforced. The study also recommends that policymakers should design strategies and tools to support transparency and accountability for Milk collection centers and dairy cooperatives governance as prerequisite for the successful transition into formal value chain.

Lastly, a broader study to cover more districts in Rwanda can be conducted to confirm whether the same results apply.

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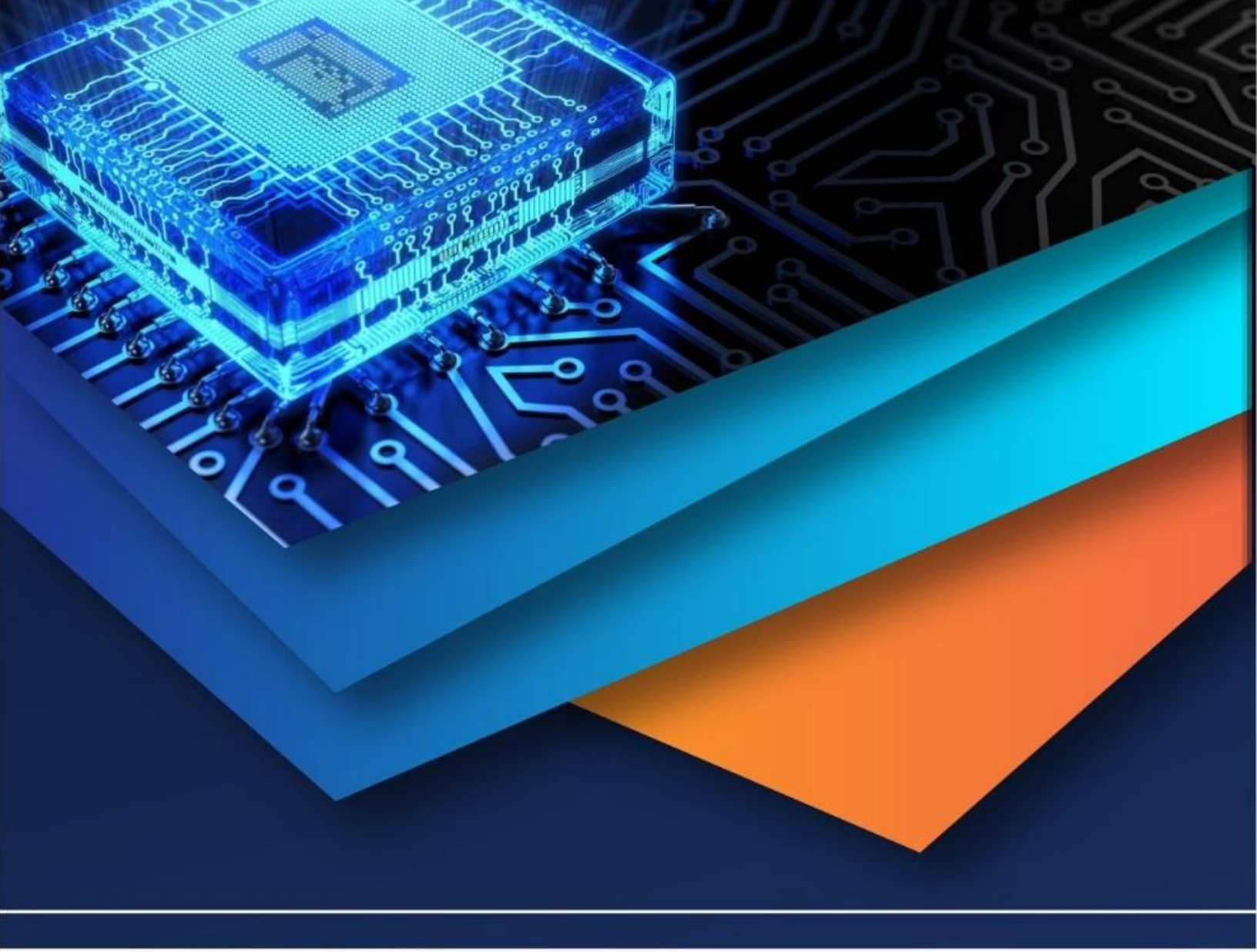

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