IJFAEC
International Journal of
Food and Agricultural Economics

MARKET DECISION PREFERENCES OF DAIRY FARMERS TOWARDS TRADITIONAL AND MODERN CHANNELS OF MILK MARKETING: AN EVIDENCE FROM PUNJAB PROVINCE OF PAKISTAN

Mazhir Nadeem Ishaq

Northeast Agriculture University, College of Economics and Management,
Department of Agriculture Economics, China
Email: mazhir.nadeem@neau.edu.cn

Li Cui Xia

Northeast Agriculture University, College of Economics and Management,
Department of Agriculture Economics, China

Rukhsana Rasheed

Northeast Agriculture University, College of Economics and Management,
Department of Agriculture Economics, Harbin, 150030, P.R.China.

Muhammad Abdullah

University of Sargodha, Department of Economics, Lyallpur Campus, Pakistan

Abstract

This study was specifically conducted in the four districts of Punjab province of Pakistan. The principal objective was to identify major explanatory variables that might influence dairy farmers' market participation decisions regarding the selection of traditional and modern channels of milk marketing. Data was collected from field survey and the sample size comprised of 320 dairy farmers, randomly selected from study area. Multinomial logit model was used an econometric tool to estimate the impacts of fourteen independent variables on the dependent variable (selection of milk marketing channel). Model results showed that eight factors like gender, old aged farmers, long distance between dairy farm and urban market, easy milk selling at door step, advance cash payment, lack of quality inspection, strong social relationship with milk collectors, and better milk price were important predictors influencing milk producers to choose traditional channels for the sale of their milk produce. Impacts of these variables were significant at 5% of significance level except long distance which was significant at 1%. Conversely to this, four factors such as high education level of dairy farmers, large herd size, provision of extension services, and purchase of evening milk were motivating dairy farmers to sell milk through modern channels. Traditional milk channels were preferred by majority of milk producers but these channels were lacking in delivering the quality milk to consumers. Policy implication for sustainable milk marketing might be the provision of dairy advisory services, advance payment framework, improving logistic infrastructure, and enforcement of milk quality inspection could ensure milk safety along sustainable milk supply.
Keywords: *Milk marketing, traditional channel, modern channel, dairy farmers, multinomial logistic regression, Punjab.*
Jel Codes: *Q13, Q02, Q12*
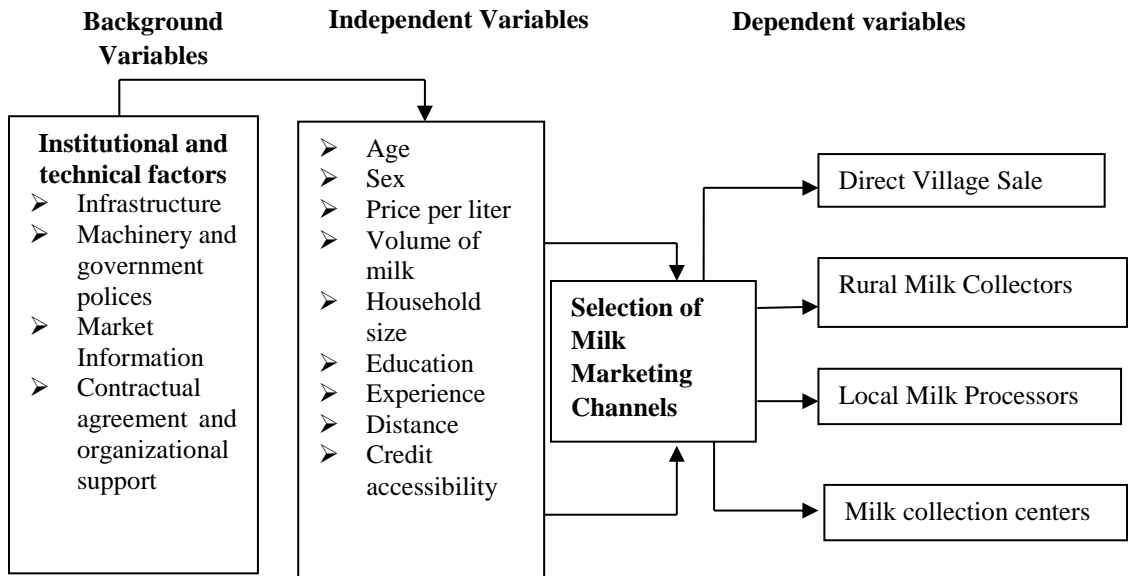
1. Introduction

Milk is a perishable produce which necessitates effective marketing channels. Milk production provides a source of income for dairy farmers as well as an important mean of animal protein for milk consumers. Farmers' market participation is an indicator for income generation through the sale of agricultural surplus (Vijay et al., 2009). Income earned from the sale of agricultural products is utilized for cultivating next crops and to acquire other life necessities. Marketing plays an important role to achieve the overall objectives of food security, poverty reduction and sustainable agriculture. Marketing channel can be described as "a system" which is composed of alternative production flows through a variety of intermediaries (middlemen) and various business activities (Coughlin et al., 2001). Enhancing the ability of dairy farmers to effectively engage in milk marketing channels is a key challenge affecting the milk production. Provision of better and efficient market infrastructure make it easy for farmers to fetch real outcomes of marketing function (Rahman and Westley, 2001; Shipi & Deininger, 2008). However, dairy farmers still find it difficult to participate in markets, especially in formal markets. In order to offer a good choice for milk marketing channels, farmers seek a wise market selection that can offer higher margins. The sole solution to achieve this objective is to make the markets more formalized and regulated (Nkwasibwe, 2014).

In Punjab province of Pakistan, milk marketing structure can be categorized into two major segments i.e. traditional marketing channels and modern marketing channels. Although the sale of milk to local residents or village neighbours is also a market choice for subsistence dairy farmers. Traditional channels sell unprocessed milk in loose form. Traditional or informal milk marketing channels are characterized by large number of intermediaries such as rural milk collectors, localized small scale milk processors, milk /dairy shops and tea shops between dairy farmers and milk consumers. Traditional marketing channel deliver milk to consumers in non-sophisticated ways and most of times this marketing system operate without acquiring any license from government authority. Modern or formal milk marketing channel is an improved gesture of regulated market that offer innovations in milk collection and marketing practices. Modern milk marketing channels are operated by large commercial milk processing plants/ companies. Modern milk marketing channel are regulated and worked under legal license obligatory obtained from concerned government department. To ensure the purchase of good quality milk and to facilitate milk collection phase, dairy companies have established their own network of milk collection centres (MCCs) in rural areas. Milk processing factories produced a wide variety of dairy products such as pasteurized packed milk, UHT, skimmed milk, butter, cheese, and ice cream etc.

In Punjab, milk marketing is exclusively dominated by traditional marketing channels that hold 94% market share in total milk marketing structure while modern marketing channel contributed only 6% in milk supply (Zia, 2006). Market participation of dairy farmers in Punjab province was constrained by transaction costs barriers, poor infrastructure, lack of own transportation means, large distance from urban market and inadequate market information. An efficient marketing infrastructure improves rural economy by incorporating value additions at each step of supply chain (Wiegratz et al., 2007). Farmers are the least but primary beneficiaries along dairy value chain, their selection of marketing channel matters a lot (Dries et al., 2009).

Research question arises what are the factors that influence dairy farmers' decision for choosing milk market channels under utility maximization framework. Analysis of these factors would provide valuable information for understanding dairy farmers' attitude towards marketing activities. Furthermore, it would also facilitate dairy development policies and programs for sustainable development. The conceptual framework to identify possible factors that might influence the choices of dairy farmers to select a particular milk marketing channel

is based on their consideration to obtain maximum benefits. The conceptual framework for this study could be shown as in Figure 1.

Figure 1. Conceptual Framework of Factors Influencing Milk Marketing Channel Selection

This study focused to identify the explanatory variables such as socio-economic, institutional and technical factors that could influence dairy farmers' selling decisions from the available marketing channels. Specific objectives of this study were:
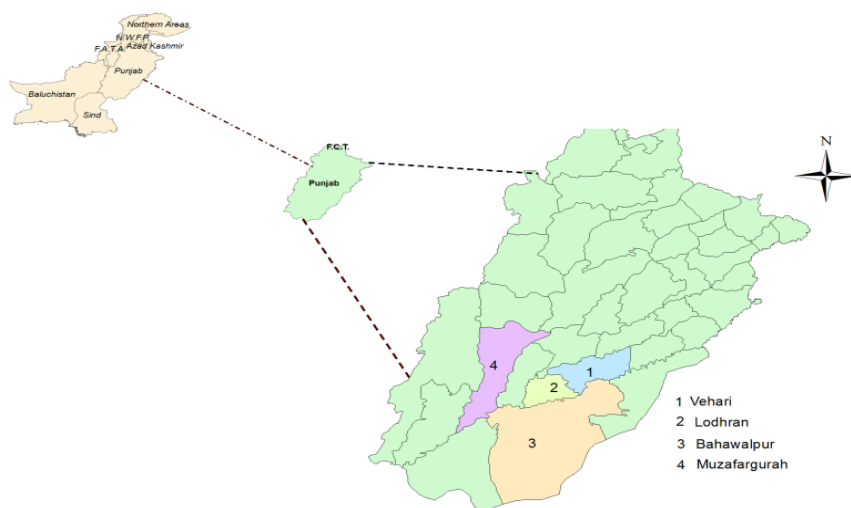
a) To investigate dairy farmers' market choice decisions for the traditional and modern channels of milk marketing.
b) To identify how their marketing choice decisions are influenced by various socio-economic and institutional factors.
c) To develop policy measures for improving milk marketing system for providing maximum benefits to dairy farmers and milk consumers.

2. Materials and Methods

2.1 Data Sources

2.1.1 Study Area and Sampling Techniques

Milk production is carried out in all the geographical parts of Pakistan. However, share of Punjab province in Pakistan's milk production is more than 60% (GOP, 2016). This study was specifically conducted in the southern region of Punjab province that offers a rich livestock population. The study area was comprised of four districts that include: Vehari, Lodhran, Bahawalpur and Muzaffargarh. The geographical location of study area could be seen in Figure 2.

Figure 2. Geographical Location of Study Area

Small dairy farmers were the target population for this study. A multistage random sampling technique was applied to select the respondents. In the first stage of sampling, two Tehsils (an administrative sub-division of a district) of each district were selected after discussion with livestock and dairy experts. Eight tehsils selected for this study were: Mailsi & Vehari (district Vehari); Kehror Pacca & Dunyapur (district Lodhran); Bahawalpur & Yazman (district Bahawalpur); Muzaffargarh and Jotoi (district Muzaffargarh). In the second stage, two villages were randomly chosen from each tehsil. At the final stage, a purposive sampling technique was used to select forty dairy farmers from each village and thus a total of 320 dairy farmers from four districts were interviewed. Furthermore, some experts from dairy and livestock research institutions as well as from agriculture departments were also contacted to obtain the useful information pertaining to the specific objectives of this study.

2.1.2 Methods of Data Collection

Both primary and secondary data sources have been used in this study to obtain reliable and valid information. Primary information about the existing situation of milk production and marketing practices was gathered through informal meetings with farmers. The questions asked were simple and easy to comprehend for the comfort of less educated farmers. These informal meetings provided a base relating to the background of issue and afterword a pre-test survey was arranged to check the validity of subjected questions. Subsequently, final questionnaires were developed for dairy farmers engaged in milk marketing channels. The issues on which data were collected from milk marketing participants were as follows:

i.   Household's personal characteristics covering information about their age, gender, education level, family size, income level and dairy farming experience.

ii.   Information related to dairy farming activities such as dairy herd size, costs of milk production, (animal cost, fodder, vaccination & drugs, dairy farm structural cost), volume of milk production, methods of milk marketing system, price of milk and income generated from it.

iii.   Information related to milk hygienic practices and awareness for better dairy management practices were collected from dairy farmers. Milk collection centers were also

contacted to examine which milk quality testing and payment methods they were using at the time of milk purchase.

3.2 Model Selection and Data Analysis

The following two types of data analysis techniques have been applied:

3.2.1 Descriptive statistics

The descriptive data analysis include the calculations of mean, percentages and standard deviation in processing of comparing socioeconomic and demographic characteristics of dairy farmers.

3.2.2 Multinomial Logit Model

Dairy farmers' decisions to select either traditional or modern channels or even not participate signify their direction towards maximum utility approach. Milk marketing channel selection described the decision of dairy farmers to sell milk directly to village neighbour sale, traditional milk collectors or to milk collection centers (MCCs) of dairy processing companies. It followed that P(Yi=j) indicates the probability of milk selling to modern channel of milk marketing and (1-Pi) represented either selling through traditional channel. In other words, the model was used to analyse the odds of milk selling to modern channel, or selling through traditional channel with reference to base category of direct village neighbour sale. Considering the above situation, the logit model assumes *(Ii)* factor which predicts the selection of milk marketing alternatives and can be specified as in equation:

$$MKTCH_{ij} = \beta_j X_{ij} + \varepsilon_{ij}$$

Where,

MKTCH*ij* denote the 3 choice of ith dairy farmers for milk marketing channels selection (*j*=1, 2, 3) for traditional channels, modern channel of milk marketing or direct village sale, respectively.

B*j*is a coefficient of specific channel

X_{ij} is a vector of farmers' characteristics that together influence the marketing channel selection.

ε_{ij} is the error term

Multinomial Logistic Regression model was very helpful to estimates the probability of individual "i" choosing a particular market outlet (Borooah, 2002; Fafchamps & Hill, 2008). This technique provides empirical estimates of how variations in independent variables (various personal factors, economic factors and institutional factors) affect the probability of dependent variable (selection of milk marketing channel). Multinomial logit model was specified as a function of fourteen independent variables influencing dairy farmers' market channel choices:

$$MKTCH_j = \beta_0 + \beta_1 GENDHH + \beta_2 AGEHH + \beta_3 EDUHH + \beta_4 FSHH + \beta_5 DIST + \beta_6 HS$$
$$+ \beta_7 EASMS + \beta_8 ADVMP + \beta_9 MLQI + \beta_{10} AUXSR + \beta_{11} SOCR$$
$$+ \beta_{12} EXTS + \beta_{13} EVNMP + \beta_{14} MLPRIC + \mu_{ij}$$

The explanatory variables included in above model were: dairy farmers' age, gender, education, family size, distance from urban area, number of milking animals, easy selling of milk, provision of advance cash milk payment, milk quality inspection, provision of auxiliary services, social relationship, advisory service and purchase of evening milking. The variables and their measurement descriptions are illustrated in Table 4.1

Following Greene (2000), probability of milk market channels selection by considering Xi covariates is given as:

Table 1. Description and Measurement of Variables Used in Logistic Model

Variables	Descriptions	Type	Values
Dependent Variable			
MKTCH	Milk market channel selection	Dummy	1= traditional marketing channel 2= modern marketing channel 3= direct village or neighbor sale
Independent Variables			
Gender	Gender of milk producers	Dummy	1= male, 0=female
Age	Age of milk producers	Continuous	Number of years
EDUHH	Education level of milk producers	Categorical	Categories are based on number of schooling years
FSHH	Family size of milk producers	Continuous	Number of persons in a household Family
DIST	Distance from urban milk markets	Continuous	Kilometers
HS	Herd size	Continuous	Number of milk animals on dairy farm
EASMS	Easy sale of milk at dairy farmers' door step	dummy	1=Yes, 0=No
ADVMP	Advance cash payments for milk sale	dummy	1=Yes, 0=No
MLQI	Milk quality inspection	dummy	1=Yes, 0=No
AUXSR	Auxiliary services by milk collectors	dummy	1=Yes, 0=No
SOCR	Social relationship with milk collectors	Dummy	1=Yes, 0=No
EXTS	Provision of Extension services for dairy husbandry	Dummy	1=Yes, 0=No
EVNMP	Purchase of evening milking	Dummy	1=Yes, 0=No
MLPRIC	Milk selling price	Continuous	Price in Pakistani Rupee (PKR)

$$PROB(Y_i = j) = \frac{e^{\beta_{jxi}}}{1 + \sum_{i=1}^{i=n} e^{\beta_{jxi}}}$$

Where, Yi is the observed response for the ith observation (i.e. the dependent variable, Yi=1 for traditional channel of milk marketing, Yi=2 for modern marketing channel). Direct village milk sale was used as base outcome. I =1,2,3,……*m* are observations for the selection of traditional or modern channel of milk marketing s; m is the sample size; X*jii*s the jth independent variables for the i[*th*] observation β*i* are parameters to be estimated. Specifically,

$$PROB(Y = 1) = \frac{1}{1 + \sum_{j=1}^{j=3} e^{\beta_{jxi}}}$$

The parameters can be estimated by maximum likelihood procedure as:

$$ln\left[\frac{P_{ij}}{P_{i1}}\right] = \beta_j X_i$$

Where the marketing channel selection is the log odds that a milk producer will choose market j relative to the base category of direct village milk sale market. The marginal effects of all explanatory variables for (Xji) on the choice of milk marketing channels with respect to Xji, can be calculated by following equation:

$$\frac{\partial p}{\partial x_i} = \frac{\partial}{\partial x_i}[\exp(x,\beta)/(1+\exp(x,\beta))] = p(1-p)\frac{\partial x,\beta}{\partial x_i}$$

Whereas β and P represented the parameters and likelihood of milk marketing channels. Marginal likelihood gave better trends and represented changes in milk marketing channels for a given change in independent variables. In case of dummy variables (1 or 0) such as dairy farmers' gender, marginal effect is the difference in probability due to belonging to one group rather than the other e.g. dairy farmer male versus female. For discrete variables such as education of dairy farmers, marginal effect is the change in probability due to an increase in one year schooling. The influence of other categorical and continuous factors can also be interpreted analogously. The magnitude, statistical significance and the signs i.e. positive or negative showed the influence of probability of choice of selling milk within two marketing channels.

3. Results of Analysis

3.1 Descriptive Results

The household characteristics of dairy farmers have important socio and economic implication on market access, participation and marketing decision. Data collected from dairy farmers was analyzed and the important descriptive statistics in relation to milk marketing channels have been mentioned in Table 2. The information showed that male dairy farmers accounted for 71.8 percent while female accounted 28.2 percent of total milk producer sample. A mixed dairy farming system was found in the study area. Both male and female dairy farmers participated in dairy farming. Females contributed more labor in forage cutting, cleaning of dairy farm, milking the cows, milk selling, butter and ghee making activities. Mean age of dairy farmers was 46.5 years which showed that middle age group was more involved in milk production and marketing. This implied that dairy farmers were in productive age of their life and were able to generate income to run their household lives.

Table 2. Descriptive Statistics of Dairy Farmers in Study Area

Variables	Mean	Std. Dev	Minimum	Maximum
Gender	0.718	0.282	0	1
Marital Status	0.883	0.117	0	1
Occupation	0.85	0.15	0	1
Age in years	46.5	14.9	24	72
Education	5.2	7.3	0	16
Family Size	5.8	3.8	3	9
Distance to urban Market	11.5	9.8	2.5	21
Herd size	3.6	5.8	2	7
Gross Income	1,46,270	78,450	80,700	1,65,150
Milk Prices	46	5.8	40	48

Source: Filed survey data, 2017.

Average family size of dairy farmers was almost 6 persons. According to sub-continent culture some families had large household size up to nine persons. However, social structure is slowly adjusting to rational family size and now majority of well-off household tend to have smaller family size. Education and skills contribute an important role to manage the business as well as decision making process. Values in Table 2 described that dominant level of education for dairy farmers was primary education (5 years schooling). Marital status showed that 88.3% dairy farmers were married while remaining were single, divorced or widowed. This situation implied that married persons due to family responsibilities work hard to expand their household income base. Cash income generated from milk production and marketing activities was utilized to fulfill their various households' expenditures. Results in Table 2 reported that almost 85% dairy farmers belong to agriculture and livestock farming.   Dairy farmers' average distance from urban market was 11.5 kilometres. Milk production was carried out in far flung areas to peri-urban areas. Herd size was composed of milk animals and it was a continuous variable. The mean size was 3.6 animals and cow and buffalo were the major dairy animals. Gross income of dairy farmers was also considered an important variable that could affect marketing decision. Income was measured in local currency (Pakistani Rupee). Average income size was around PKR=1, 46,270. Milk price was another factor that might influence dairy farmers' attitudes for market participation. Mean milk price prevailing in rural areas was PKR 46, as could be seen from Table 2.

3.2 Distribution of Dairy farmers by the Type of Marketing Channels

Market participation of dairy farmers from four districts i.e. Vehari, Lodhran, Bahawalpur and Muzaffargarh showed that they could sell milk through different channels. For example they could sell milk directly to the village milk consumers, to milk collectors/Dhodi, restaurants, local milk processors, milk collection centres of dairy processing companies and to urban milk retailers. Out of this study sample size, it was disclosed that (88%) of the dairy farmers sold milk produce via traditional marketing channel (local milk collectors/Dodhi), 3% to village neighbours consumers and the rest of dairy farmers (9%) sold it milk collection centres (MCCs) operated by the representatives of dairy processing plants and dairy cooperatives. The market share of different marketing channels has been shown in Figure 3. Earlier research studies conducted by Zia (2006); Tanvir, (2007); Riaz K (2008) also presented the comparable results. These findings validated the information describing that almost 94 percent of rural milk is sold in raw/ un-processed form through traditional milk marketing while 6 percent is sold via modern or formal channel of milk marketing channel to produce UHT milk and pasteurized milk.
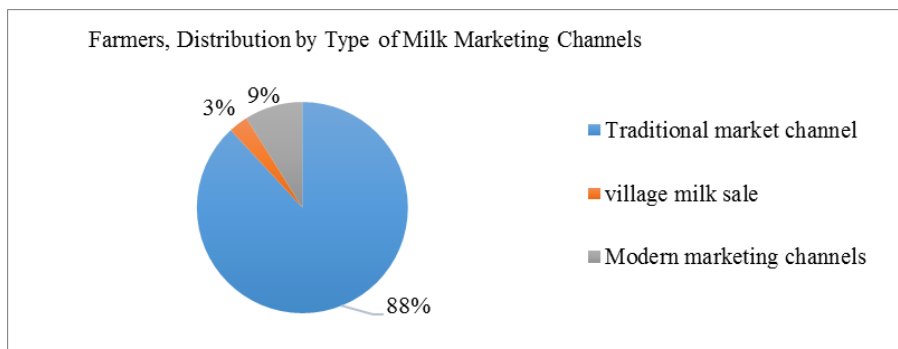

Figure 3. Farmers' Distribution for Milk Marketing Channels

This distribution of dairy farmers according to milk marketing channels confirmed that traditional milk marketing channels hold a dominant share in milk market structure.

3.3 Econometrics Results

Various socio-economic, institutional and physical factors (taken as explanatory variables) were analysed against the dependent variable (selection of milk marketing channel) through multinomial logit model. Table 3 showed the outcomes of Multinomial Logit Model which empirically explained the effects of explanatory variables on dairy farmers' choice for milk marketing channel selection. The result in Table 3 indicated that Logit model was tested against 14 independent variables. Overall variation explained by all variables showed that this model could explained 67% percent variations towards dairy farmers' attitude for the selection of milk marketing channels.

Table 3. Multinomial Regression Results Influencing Farmers' Marketing Channel Selection

Influencing Factors	Traditional channel			Modern channel		
	Coefficient	Std. Error	p-value	Coefficient	Std. Error	p-value
Gender	1.551	0.563	0.022**	-0.463	0.563	0.302
Age	0.987	0.414	0.014**	-0.73	0.387	0.185
Education of milk producers	-0.043	0.073	0.235	0.578	0.252	0.021**
Family size of household	0.214	1.72	0.277	-0.041	0.358	0.183
Distance from urban milk market	0.326	0.108	0.001***	-0.047	0.09	0.184
Herd size	-1.781	0.813	0.028**	0.941	0.487	0.053**
Easy sale of milk at door step	0.412	0.081	0.002***	0.043	0.073	0.15
Advance cash payment of milk sale	1.868	0.827	0.034**	-1.73	1.78	0.185
Milk quality inspection	-0.623	0.27	0.048**	0.3	0.376	0.39
Auxiliary services for milk producers	0.152	0.631	0.375	1.27	0.734	0.674
Social relationship of milk collectors' with producers	0.107	0.052	0.007**	0.3	0.188	0.762
Extension services provided by milk collectors	0.117	0.531	0.476	0.547	0.221	0.024**
Purchase of evening milk	-1.847	2.037	0.025**	1.03	0.987	0.082*
Milk Price	0.285	0.118	0.056**	0.9	1.77	0.37
Pseudo R^2=0.67, log likelihood=-111.8043, $LRx^2(28)$=81.54, Prob>x^2=0.000, Number of Obs=320						

Notes: Base category was direct village or neighbor milk sale; Asterisks denote level of significance ***$P < 0.01$, **$P < 0.05$ and *$P < 0.10$ at 1%, 5% and 10% levels, respectively.

Following explanatory variables were found significant ($P<0.05$) in explaining dairy farmers' selection for selling milk through traditional and modern milk marketing system. Dairy farmers' gender, age, distance from urban market, easy selling of milk at door step, provision of advance payment for milk, influence of social relationship with milk collectors,

and milk price had positive influence for traditional channel of milk marketing. Whereas the factors such as dairy farmers' education, number of milking animals (large herd size), extension services to dairy farmers, and purchase of evening milking were positive and significant factors influencing the choice of dairy farmers to select modern channel of milk marketing. The marginal effects related to these independent variables are presented in Table 4.

Table 4. Marginal Effects $\partial P_j/\partial X_{ij}$ of the Multinomial Logistic Regression Model

Independent Variables	Traditional Channel		Modern Channel	
	$\partial P_j/\partial X_{ij}$	p-value	$\partial P_j/\partial X_{ij}$	p-value
Gender	0.169	0.022**	-0.032	0.302
Age	0.049	0.014**	-0.015	0.185
Education of milk producers	-0.283	0.235	0.132	0.021**
Family size of household	0.031	0.277	0.019	0.183
Distance from urban milk market	0.132	0.001***	0.047	0.184
Herd size	0.419	0.028**	0.182	0.053**
Easy sale of milk at door step	0.234	0.002*	0.233	0.15
Advance cash payment of milk sale	0.187	0.034**	-0.103	0.185
Milk quality inspection	-0.074	0.048**	0.011	0.39
Auxiliary services for milk producers	0.037	0.375	0.019	0.674
Social relationship of milk collectors' with producers	0.126	0.007**	0.031	0.762
Extension services provided by milk collectors	0.140	0.476	0.120	0.024**
Purchase of evening milk	-0.371	0.025**	0.223	0.082*
Milk Price	0.061	0.056**	0.000	0.37

Source: Field survey data, 2017. Asterisks denote level of significance ***$P < 0.01$, **$P < 0.05$ and *$P < 0.10$ at 1%, 5% and 10% levels, respectively.

3.3.1 Gender of Dairy farmers

Gender of dairy farmers was a dummy variable that took the value of 1, if dairy farmer was male and 0 otherwise. Model results showed that gender was significant for traditional milk marketing channel at 5% significance level with reference to base category of direct village sale. Male dairy farmers were expected to be more market oriented as they have more market information. Female headed dairy farming households tend to prioritize milk for family consumption rather than selling in market especially when the families have children under-age of six. Therefore in small dairy farmers, there existed a competition for children milk requirement and volume of milk sold out in market. However, in this study female dairy farmers were positively influenced for traditional channel of milk marketing. It was due to familiarity factor, as traditional milk collectors (Dodhi) were well known to their locale and females feel more comfortable to sell milk along with traditional system. They could easily communicate and bargain with local well known milk collector as compare to deal with managers of modern milk collection centres. Furthermore, cultural restrictions of study area also restricted the females to freely perform marketing activities.

3.3.2 Age of Dairy farmers

The age of dairy farmers' was positively related to select traditional channel of milk marketing. Regression coefficient illustrated that one year increase in age would have a positive impact for choosing traditional channel of milk marketing by a factor of 0.987 and it was significant at 5 percent level of significant. Likewise age had negative impact for modern channel selection by a factor of 0.73, although not statistically significant. Moreover, the marginal effects for traditional channel of milk marketing (ME=0.049) showed that a one year increase in age would increase the probability to select traditional channel by 4.9 percent while reduced the chances of modern channel selection by 1.5 percent (Table 4). These results were in line with findings of Sharma et al. (2007) affirming that younger farmers tend to adopt new technologies as opposed to older farmers who opt for traditional channel. Old age farmers were more reluctant and consistent with their old traditions and hesitated to adopt new innovations. According to Regnard (2006) age influence individual ability to make rational decision, the income generating capacity and accumulation of wealth.

3.3.3 Education Level of Dairy farmers

It was a continuous explanatory variable measured in formal years of schooling. Table 3 showed that higher education level of farmers was evidenced statistically significant for modern channel of milk marketing at 5 percent level of significance. The marginal effects of modern channel (ME=0.132) expressed that one year increase in education increased the probability of a farmer selling milk through modern marketing channel by 13.2 percent relative to direct village milk sale. There was found a negative relationship between dairy farmers' education and adoption of traditional milk marketing system (Table 3). These results were consistent with the previous studies (Jari, 2009; Park, 2009). These studies explained that education level considerably enhanced market information and hereafter market participation to exploit the best marketing alternatives which provide them maximum benefits. Education play an important role in the adoption of new skills and tends to convince household to accept new motivational ideas that improve marketable volume. Higher education directed the dairy farmers to obtain updated information about milk demand, supply and prices which would result in more precise decision for selection of milk marketing system. Therefore, education of dairy farmers negatively affects the choice of traditional channel of milk marketing.

3.3.4 Family Size

The variable of family size did not significantly affect the likelihood of traditional or modern marketing channel relative to direct village milk sale. This was reflected by regression coefficients namely 0.214 and -0.391 for traditional and modern channels respectively (Table 3). An increase in family size increases the domestic milk consumption requirements. Large household size offered less milk to sell in market. As per local cultural circumstances the family milk consumption requirements are more important than to earn revenue by selling milk. When less milk is available to market than usually farmers prefer to sell family surplus milk through traditional channel of milk marketing.

3.3.5 Distance between Dairy Farms and Urban Market

This variable has been measured in kilometres. The probability of dairy farmers for choosing traditional channel was positively influenced with the increase in distance between dairy farm and the urban market (Table 3). The dairy farmers residing in urban or in peri-urban areas have more access to latest market information, bear less transportation expenses, less

chances of milk spoilage and have more potential milk market alternatives. Long distance between dairy farm and nearest urban market created obstacle to access alternative markets and it had a positive influence for the selection of traditional market channel. This variable was significant for traditional channel at one percent level of significance having a coefficient of 0.326. The influence for modern milk marketing was negative although not significant. This indicated that one kilometre increase in distance from urban market, there was 13% higher probability that a dairy farmer would choose traditional channel (Table 4). Farmers living nearby cities or milk collection centres (MCCs) established by dairy processing companies prefer to sell their milk to these modern marketing channels. Transportation and other marketing costs decreased if the distance decreased from dairy farms. But the farmers who lived in far flung areas prefer to sell to local traditional milk collectors who collected milk from their door step. The study of Sharma et al., (2007) also found that dairy farmers who have easy access to alternative markets would prefer not to sell milk to traditional channels.

3.3.6 Herd Size

A negative relationship was found between large herd size and selection of traditional channel of milk marketing at 5 percent significance level. Table 3 showed that a unit increase in the number of milking cows reduced the likelihood of choosing traditional channel of milk marketing as compare to using village neighbour milk market by a factor of 1.78 units. However a unit increase in the number of milking animals, increased the probability of choosing modern channel of milk marketing by 0.94 units. Hence, large herd size was significant factor for modern channel of milk marketing at 5 percent level. This finding was in line with previous study of Mutura et al., (2015). Possible justification may be, as the herd size increases, milk production rises and resultantly there will be marketable surplus. This situation motivated the farmers to shift towards more organized marketing channels. Larges farmers are likely to have high bargaining power as well as low transaction costs. In addition, rearing of large number of milk animals needed more working capital at dairy farms which forced dairy farmers to supply their milk to those channels that handle bulk volumes. Modern channel of milk marketing could pay farmers whole lump sum milk revenues for continuing their livestock operations. However, small dairy farmers prefer to sell their surplus milk via traditional channel. Furthermore, large dairy farmers have more exposure for better infrastructure and latest market information. Therefore, they tend to sell large volume of milk to modern channel of milk marketing rather than selling via traditional channel. Due to this reason, traditional milk marketing system was discouraged by large farmers.

3.3.7 Easy Milk Selling at Farm-gate

This variable illustrated the marketing convenience and was binary in response. This factor was positive and significant for traditional channel at the 5 percent significant level. Marginal effects (ME=0.234) denote that for response 1 (yes), the likelihood for traditional channel would improve by 23% relative to village milk sale for neighbours. This variable was also positive for modern channel of milk marketing, although not statistically significant. Perhaps it was more convenient for farmers who lived in remote rural areas where means of transport and road infrastructure were not good, to easily sell their milk produce to local milk collectors. As traditional milk collectors/Dodhi collects milk on daily basis from these remote areas, so it was best option for farmers to sell milk to traditional channel at their door step rather than modern channels.

3.3.8 Advance Milk Payments

Provision of advance milk payment was also binary response variable (1=yes, 0 otherwise). Model results in Table 3 showed a positive relationship for advance milk payment method and traditional channel. Regression estimate was 1.868 and statistically significant at 5 percent level of significance. For modern channel this variable was negatively correlated, although not statistically significant. To ensure consistent supply of milk, traditional milk collectors offered advance payments to dairy farmers. There was verbal agreement that dairy farmer would not sell their milk surplus to other milk collectors. Small farmers often remained income-deficient, in dire need of cash money and they happily accept advance milk payment to continue their farming activities. However, the modern marketing channels only used postpaid method. Due to this reason, traditional marketing channel was an attractive milk market for small farmers. Marginal effects (ME=0.181) illustrate that small farmers were 18 percent more inclined towards traditional marketing channel. Unlike the banks, financial institutions and other cooperatives, traditional milk collectors don't require any security or collateral except that dairy farmers would be bound to sell their milk only to them at the pre-agreed milk price. Therefore provision of advance payment by milk men was found strong motivational factor for the dominance of traditional channel of milk marketing over modern channel in the study area.

3.3.9 Milk Quality Inspection

Inspection of milk quality level before milk purchase was an important factor which determined the milk safety towards human health. This factor was binary response variable (did you like lack of milk quality test=1, 0 otherwise). Performing milk quality inspection was negatively correlated with traditional channel and was significant at one percent level. However, quality inspection had positive relation with modern channel but not statistically significant. Like the marginal effect (ME= -0.074) indicated that application of milk quality inspections decreased the probability of dairy farmers to choose traditional channel by 7.4 percent with reference to village milk sale. It implied that dairy farmers avoid milk quality inspections. During field surveys, it was observed that traditional milk collectors usually buy milk on quantity/volume basis but not on milk quality basis. They did not perform any type of chemical or microbiological tests to check milk quality. They just used sensory methods such as taste, temperature and outdoor etc. On the other hand modern milk channel (MCCs) buys milk on the basis of milk quality and they conduct certain chemical and microbiological tests. MCCS decide milk price on the basis of milk quality. Less educated farmers did not like such quality inspections parameters and they feel comfortable with traditional milk collectors.

3.3.10 Social Relationship

Social relationship between buyer and seller has significant impact on trade transactions. In this study this factor was included in model as dummy variable (Do you have good social relationship with collector, 1=yes, 0 otherwise). The coefficient of this explanatory variable was positive for both marketing channels but only significant for traditional channel. Results of model showed that response (yes=1) of this factor increased the probability to choose traditional channel of milk marketing by 12.6 percent and for modern channel by 3.1 percent. Traditional milk collectors resided in same villages or locality, they were well known to almost every farmer, participated to every social or cultural gatherings. Hence, they have strong social relationship among each other. This social norm and familiarity bond; persuaded dairy farmers to sell milk to traditional milk collectors who may be their friend, relative and dear one. Contrary to this, managers of milk collection centres were commercial enterprisers and they

did not have strong relations with every person in that rural community. Social bond of MCCs was weaker as compare to traditional milk collectors. Due to this reason, traditional channel showed dominance in rural areas.

3.3.11 Purchase of Evening Milk

In our study area, milking practice of dairy animals was performed twice a day i.e. in morning and evening times. This question was specifically included in the model to see its impact on both milk marketing channels. It was binary response variable (Does your milk collector purchase evening milk, 1=yes, 0 otherwise). Regression results evidenced statistically negative response for traditional channel at 5 percent significance level. However, this factor showed positive relationship for modern channel and also significant at 10 percent level. Likewise, value of marginal effects (ME= -0.374) indicated that none purchase of evening milk reduced the likelihood of a farmer to choose traditional channel by 37.4 percent. Conversely, purchase of evening milking increased the chances of modern channel selection by 22.3 percent (Table 4).

Generally, traditional milk collectors had limited mobility and small scale of operations. They purchased milk in morning from different small dairy farmers on daily basis. After collection of morning milking, they transported this milk to urban centres via motorcycle or bicycle and sold out milk directly to urban households or to milk retailers/ shops. This practice usually completed till afternoon and before evening they returned to their rural areas. Now they did not purchase evening milk as they could not transport this milk again to urban areas. Furthermore, they lacked milk cooling vats to store the evening milk for next day delivery. Modern dairy processing companies had installed milk cooling containers (chillers) at their milk collection centres. After purchase, milk temperature is reduced at 4 C^o or below to preserve its shelf life. Dairy farmers who sell milk to traditional milk collectors, usually processed evening milk into dairy products or consumed at home or sell it to modern milk collection centres if available nearby. Therefore, this factor negatively affected towards the dominance of traditional channel of milk marketing.

3.3.12 Milk Prices

Price in traditional milk marketing system was determined on personal negotiations rather on fat-content basis as was in case of modern channels of milk marketing. Model results showed a positive influence of milk price for traditional channel. One unit increase in price influence the framer's selection for traditional milk marketing by a factor of 0.285 units. This result was significant at 10 percent level of significance. Value of ME=0.061 indicates that traditional milk market channel likelihood would increase by 6.1 percent for unit increase in milk price (Table 4). This happens as traditional milk collectors buy milk on volume basis. This factor adjusts the malpractices of water adulteration in milk which was practiced to increase milk volume. Traditional milk collectors offered high prices because they want to ensure sustained milk supply. In case of modern milk collection centres, milk price was decided on fat-content or milk quality basis but not on volume basis.

3.3.13 Dairy Extension Services

The impact of extension services provided by milk collectors to dairy farmers was positive. The likelihood to choose modern channel of milk marketing increased by 6.9 percent in relative to village milk sale. This means that farmers were more likely to participate in modern milk channel if the extension services were provided. It might be due to extension services that assisted in the improvement of dairy farm management and milk production. According to

Elzo et al., (2010) access to information increased household ability to perform more superiorly. They could applied available knowledge and skills to undertake new opportunities. Likewise, results regarding the provision of auxiliary service like paying of utility bills, purchase of cattle feed from city or mobile recharge also witnessed a positively influence on traditional channels. As traditional milk collectors visit cities on daily basis, so farmers asked them to perform some household petty matters to solve on their behalf. However, traditional milk collectors don't focus on advising dairy farmers about better dairy management practices because it might discourage their milk marketing share.

4. Conclusion and Policy Suggestions

The results derived from this study by employing multinomial logit model indicated that gender, age of farmers, long distance between dairy farm and urban milk market, easy milk selling at door step, advance cash payment, milk quality inspection, strong social relationship with milk collectors, and better milk price were important predictors for the selection of traditional channel of milk marketing. Impacts of these variables were significant at 5% significance level except, long distance which was significant at 1% level. The choice of dairy farmers to select modern channels for selling milk was positively influenced by high education level, large herd size, provision of extension services, and the purchase of evening milking. Large family size, no advisory service and not purchasing of evening milk negatively influenced the traditional channel of milk marketing system. Model was overall explaining 67% variations in dairy farmers attitude which they might considered for their marketing decision. Policy implication is that older aged dairy farmers should be educated through advisory services to make them familiar with better dairy and milk marketing practices. Extension officers should arrange frequent visits of dairy farmers to train them. Institutions for monitoring food quality standard should enforced the milk collectors to perform milk quality tests before purchasing milk from dairy farmers. This will ensure the health safety of consumers. Results of study indicated that long distance and no advance cash payment had reduced milk supply to modern channel. In order to improve milk supply and market share of modern dairy industry on sustainable basis, it is necessary that dairy companies should develop some logistic and financial aid framework. Through these strategies, milk could be collected from distanced villages and advance cash payments could be made to facilitate dairy farmers to continue their activities more efficiently.

Acknowledgement

Authors' contribution

Mazhir Nadeem Ishaq provided basic concept for the manuscript and developed the research design under the supervision of Professor Dr. Li Cui-Xia. Rukhsana Rasheed reviewed the relevant literature; Muhammad Abdullah and Mazhir Nadeem collected the data and conducted data analysis. Data interpretation and overall write-up of the manuscript was done by Mazhir Nadeem and Rukhsana Rasheed whereas; Muhammad Abdullah did technical corrections. Professor Dr. Li Cui Xia overview the manuscript and did final editing. All authors read and approved the final manuscript.

References

Borooah, V. K. (2002). Logit and Probit: Ordered and multinomial models. Thousand Oaks, Calif, USA.

Coughlin, A. T., Anderson, E., Stern, L. W., et al. (2001). Marketing Channels. Upper Saddle, Prentice Hall, New Jersey

Dries, L., Germenji, E., Noev, N., & Swinnen, J. F. (2009). Farmers, vertical coordination, and the restructuring of dairy supply chains in Central and Eastern Europe. World development, 37(11), 1742-1758.

Elzo, A., Suwanasopee, T., Yeamkong, S. (2010). Effect of experience, education, record, labor and decision making on monthly milk yield and revenue of dairy farms supported by a private organization in central Thailand. Asian-Australian Journal of Animal Science 23(2): 814-824.

Fafchamps, M., & Hill, R, V. (2005). Selling at the farm-gate or traveling to market. American Journal of Agricultural Economics 87(3):717-734.

Government of Pakistan. (2016). Economic Survey 2015-16. Economic Advisory Wing, Ministry of Finance, Islamabad, Pakistan.

Jari, B., Fraser, G. C. G. (2009). An analysis of institutional and technical factors influencing agricultural marketing amongst smallholder farmers in the Kat River Valley, Eastern Cape Province, South Africa. African Journal of Agriculture Research 4(11):1129-1137.

Mutura, J. K., Nyairo, N., Mwangi, M., & Wambugu, S. K. (2015). Analysis of Determinants of Market Channel Choice among Smallholder Dairy Farmers in Lower Central Kenya. International Journal of Innovative Research and Development 4(10): 264-270.

Nkwasibwe, A. (2014). Determinants of choice of milk marketing channels by dairy farmers in Kiruhura District, (Doctoral dissertation). MAKERERE UNIVERSITY, Uganda.

Park, T. A. (2009). Assessing the returns from organic marketing channels. Journal of Agriculture Resource Economics 483-497.

Rahman, A., & Westley, J. (2001). The challenge of ending rural poverty. Development Policy Review, 19(4), 553-562.

Regnard, C. (2006). Immigration etPrésenceEtrangèreen France. Rapport annuel de la Direction de la Population et des Migrations, Ministère de l'Emploi, de la Cohésionsociale et du Logement. RépubliqueFrançaise.

Riaz, K. (2008). A Case Study of Milk Processing: The Idara-e-Kissan Cooperative. The Lahore Journal of Economics 13(1): 87-128.

Shilpi, F., & Umali-Deininger, D. (2008). Market facilities and agricultural marketing: Evidence from Tamil Nadu, India. Agricultural Economics, 39(3), 281-294.

Tanvir, A. (2007). A case study of milk production and marketing by small and medium scale contract farmers of Haleeb Foods Ltd., Pakistan. Haleeb Foods Ltd, Lahore, Pakistan.

Vijay, P. S., Kalpesh, K., Raj, V. (2009). Determinants of Small-Scale Farmer inclusion in Emerging Modern Agrifood Markets: A study of the Dairy Industry in India. Indian Institute of Management Ahmedabad India, Working Paper. 2009.

Wiegratz, J., Nyabuntu, P., & Omagor, C. (2007). Competing and Learning in Global Value Chains-Firms' Experiences in the Case of Uganda. A study of five export sub-sectors with reference to trade between Uganda and Europe.

Zia, U. (2006). Analysis of milk marketing chain. Islamabad: Food and Agriculture Organization of the United Nations (FAO).