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Role of Extension in Developing Dairy Farmers Knowledge Toward Milk Quality in Golpayegan Township, Iran

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Abstract: The main purpose of this study was to determine the role of extension in increasing dairy farmer's knowledge in regard to improving milk quality. This study was accomplished in two parts. The first part was research and the second part was experimental research. The design for the first part of this study was descriptive- correlative research. Dairy farmers (N= 6200) were the target population for this study. Dairy farmers of Golpayegan Township have been selected using stratified randomization method sampling (n= 130). From the literature review, the researches developed an instrument to collect data. In experimental research, 12 dairy farmers were selected from 20 dairy farmers at random and plate count and lipid percentage of cow milk of dairy farmers measured in 3 repeats and 2 treatments. Findings indicated that average age of respondents was 45.8 year and 30% of respondents were illiterate. In experimental research, average of total plate count measured 333,170/ml for first treatment and it measured 912,780/ml for second treatment. Findings indicated that there was a significant relationship between age, sex, education level, dairy farming experience variables and technical knowledge. Regarding communication channels, there was found a relationship between experts of Agricultural Services Center and experts of Cheese Company in Golpayegan Township to knowledge variable. There was also a positive and significant relationship between social conditions, participating in educational class and use of extension publications and technical knowledge about milk quality. Results of analyzed variances showed that there was a significant relationship between two treatments in microbial count and fat percentage.

Key word: Milk · dairy farming · extension · knowledge · microbial count · chemical component

INTRODUCTION

The dairy industry is a large and dynamic segment of the agricultural economy of many countries [1]. Milk is one of the main sources of proteins and calcium for a largely vegetarian population [2]. Milk and dairy products are among the most important foodstuffs and the quality of raw milk is of significant importance from the point of view of human health [3]. Milk is composed of water, carbohydrate (*Lactose*), fat, protein, minerals and vitamins. While each component can be discussed separately, it is important to remember that milk is secreted as a component; the properties and importance of milk are greater and more complex than the sum of its individual component parts [4]. Milk and milk products are perishable feeds [5]. Also, milk is a highly nutritious food that is ideally suited for growth of pathogenic organisms [6]. Milk is synthesized in specialized cells of the mammary gland is sterile when secreted into the alveoli of the udder [7]. Cow's milk is among the most perishable of all foods, due to its fluid form and excellent nutritive composition. As it comes from the cow, milk provides an ideal medium for bacterial growth [8]. Many factors influence milk composition and hence the nature and abundance of the microbial count [9]. In view of food safety, microbial counts as quality indicator of raw milk and the possible impact of specific influence factors are of central importance [10]. However milk's quality relates to its chemical, microbiological, physical and organoleptic properties, as well as to its safety and to protect milk's quality, this food is handled under rigid sanitary conditions, resulting in low bacterial count, good flavor and appearance, satisfactory keeping quality, high nutritive value and freedom from disease-producing

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organisms and foreign constituents [8]. The conditions of raw milk production, in particular the hygienic practices of farmers (e.g., washing of milking equipment and pre-and post milking udder preparation), determine the contents in useful products and spoilage microorganisms [9]. The yield of milk and its chemical composition strongly influence the profitability dairy farming [10]. Deficient hygiene is one of the causes of spoilage of products, resulting in a loss of income, for farmers, smallholder dairies and dairy industries. However, only few studies have assessed the impact of farm hygiene and milk handling practices improvements on milk quality [11] and good production and herd management practices help ensure low bacteria counts and reduce the risk of the presence of microbes in the raw milk [12]. The goal of every dairy farm should be to continually improve the quality of the milk they ship off the dairy. Therefore, dairy farmers need to learn about milking, managing dairy farms and quality of milk and milk production [13]. Most dairy farmers feel responsible for the safety of milk that originate on their farms [6], but linkage between farm production practices and training practices have been weak. Production in agricultural part is accomplished by knowledge and science [14]. Small-scale dairying is an important agricultural activity for many poor families in the developing world producing valuable food products and providing a regular income and work [21]. In Iran, more than 70% of dairy farms are small-scale and are managed traditionally [15] and microbial count is the most important problem facing dairy farmers. Therefore, it is important that dairy farmer's knowledge will be increased about quality of milk and dairy products. Measurements such as bacteria levels, somatic cell count, fat, protein and others are dependent upon management strategies [16]. Yee Chye [17]stated that training and guidance should be given to dairy farmers and their workers responsible for milking, emphasize the need for hygienic practices at the farms. The safety of dairy products can be enhanced by adopted of a number of management practices that present by agricultural extension. Agricultural extension is a vital component in the agricultural development of a nation. An effective extension system provides a two-way communication channels between dairy farmers and formal research bodies and extension provides a avenue for dairy farmers to access information about the latest research findings [13]. Extension agents and dairy professionals often act as educators to encourage clients to implement new technologies [18]. Extension and agricultural professionals helps farmers achieve goals more rapidly [19]. Therefore, this study investigated the role of extension educational programs in improving the milk quality and increase dairy farmer's knowledge toward quality of milk.

Objectives:
Specific objectives were to:

- Describe dairy farmers by personal and farming characteristics (independent variables).
- Determine the technical possessed by dairy farmers regarding the milk quality.
- Determine the relationship between independent variables and dairy farmer's technical knowledge regarding the milk quality.
- Determine communications channels of dairy farmers.
- Investigate the role of training in improvement of milk quality (fat percentage and microbial count).

MATERIALS AND METHODS

This study was implied in two parts. The first part was survey research and the second part was experimental research. The design for first part of this study was descriptive-correlative research. This study was conducted 2006 in Golpayegan Township, Iran. Dairy farmers (N= 6200) were the target population for this study. Dairy farmers have been selected using stratified randomization method sampling (n= 130). From review of literature, the researches developed an instrument to collect data. Content and face validity were established by a panel of experts consisting of faculty members and graduate students at Tarbiat Modares University, Iran. Questionnaire reliability estimated by calculating Cronbach alpha. Reliability for the overall instrument was estimated 74 to 82%. The independent variables of this study were: personal and economical characteristics. Social conditions, extension-education variables and the use of communication channels. The dependent variable of the study was dairy farmer's technical knowledge. In experimental research, 12 dairy farmers were selected from 20 dairy farmers at random and microbial count and fat percentage of cow milk of dairy farmers measured in 3 repeats and 2 treatments. Information from a back ground questionnaire in survey research was used to select dairy farms with similar management practices and operational procedures. Experience was accomplished in during 3 days and caws from 12 farms were used in these experimental samples were from two treatments:

1. Raw cow milk samples from 6 dairy farmers who participated in extension educational programs (milk quality improvement programs).

2. Raw cow milk samples from 6 dairy farmers who didn't participated in extension educational programs.

Too, many points considered for measurement of adjectives of milk quality:

- All cows were brown sweis.
- Average age of all cows was between 3 to 4 years.
- Samples were collected in the evening.
- Daily milk production exceeded 15-17 kg/cow.
- The source of nutrients for all cows was similar (straw of wheat, fodder and corn concentrate).
- All cows were milked by hands.
- All cows were in similar lactation stage (2-3 first month of lactation).
- All cows were milked twice a day.
- Udder infection and special illness haven't observed in cows during 12 month ago.
- Distance from all dairy farms to experience station was nearly similar.
- In during experience period, hygienist or nutritional programs haven't exercised for the cows.

Milk samples were immediately put on ice and stored at-4°C upon arrival at the laboratory. In this study, Milko tester method used for determining lipid percentage. Standard Plate Count Method (SPC) used for counting all microbes in milk samples. There are several methods used to evaluate the amount of bacteria present in milk but the most common method is referred to as SPC. This test was performed by counting the number of colonies of bacteria that grow after one ml of milk has been incubated on standard media for 48 hours at 32°C. For analyzing data statistical software such as Minitab/14 and SPSS/13 were used.

RESULTS AND DISCUSSIION

Survey research

Descriptive statistics

Personal characteristics: The mean age of dairy farmers who participated in the study was 45.18 years. The majority of the respondents were male (62.3%). Dairy farmers were asked to report their highest level of education: Three percent of dairy farmers were illiterate; 21.5% had completed elementary education; 13.1%had completed middle school education and 22.3% of dairy farmers had high school or more education. Years of dairy farming experience ranged from 1 to 70 years (M=24; SD=14.57). Among respondents, 25.4% resided in urban areas and 74.6% of dairy farmers lived in rural areas.

Table 1: Communication channels used by dairy farmers (N=130)

Communication channels	Mean*	SD	Rank
Family and friends	3.46	1.22	1
Golpayegan cheese company	3.37	1.38	2
Agricultural service centers	3.10	1.38	3
Veterinary organization	3.09	1.21	4
Sellers of drug	2.78	1.18	5
Private experts	2.11	1.27	6
Radio and television	2.11	1.18	7

*Scale: 1=Very low, 2=Low, 3=Moderate, 4=High and 5=Very high

Social characteristics: The dairy farmers' social situation investigated by 8 questions. Generally, 25.4% of dairy farmers had weak social situation; 15.4% individuals had moderate situation; 38.5% had good situation and 20.8% had excellent social situation.

Economic characteristics: data indicated that majority of dairy farmers had $110.00-$200.00 income from milk production in each month. Average number of dairy cows in dairy farms was about 5 cows. Average daily milk production of dairy farms was 55.6 kg and majority of respondents (23.1%) stated that their daily milk production was from 15 kg to 30 kg. The majority of dairy farmers had no other agricultural income (66.2%).

Extensional information of dairy farmers: dairy farmers who participated in extension educational programs about quality milk were 48.5%. Average distance from dairy farms to agricultural services centers was 3.2 km (M= 3.2; SD= 2.98; Minimum= 0.1 km; maximum= 20 km).

Communication channels: Dairy farmers were asked to show their sources of information about awareness of milk quality. The most communication channels were family and friends, experts in Golpayegan Cheese Company and Agricultural Services Centers (Table 1).

Dairy farmer's technical knowledge toward the milk quality (chemical and microbial quality): For assessing dairy farmer's technical knowledge, 29 questions designed. On the basis of answers of respondents, their technical knowledge divided in to four levels: week, moderate, good and excellent levels. Findings showed that 13.1% dairy farmers had week technical knowledge, 37.7% had moderate technical knowledge, 37.7% had good technical knowledge and 11.5% had excellent knowledge toward quality milk.

Table 2: Relationships between independent variables and technical knowledge toward milk quality (n=130)

Variables	Dependent variable	Correlation coefficient	R	Sig
Age	Knowledge	Spearman	-0.372 **	0.000
Education level	Knowledge	Spearman	0.417 **	0.000
Dairy farming experience	Knowledge	Spearman	-0.399 **	0.000
Daily milk production	Knowledge	Spearman	0.012	0.895
Monthly income	Knowledge	Spearman	0.029	0.746
Average dairy cow	Knowledge	Spearman	0.025	0.778
Social situation	Knowledge	Spearman	0.773 **	0.000
Distance to agricultural Services centers	Knowledge	Spearman	-0.121	0.170
Measure of presence dairy farmers in extension programs	Knowledge	Spearman	0.419 **	0.000

P<0.01=**

Table 3: Compare the knowledge of two groups of dairy farmers toward quality milk (N=130)

Independent variables	Dependent variable	Level	N	Mean of attitude	t	Sig
Sex	Knowledge	Male	81	18.64		
		Female	49	14.06	7.70**	0.006
Nonagricultural income	Knowledge	Yes	86	17.24		
		No	44	16.27	4.44*	0.037
Place of residence	Knowledge	Town	33	16.03		
		Village	97	17.21	2.24	0.12

P<0.01=** P<0.05=*

Correlative statistics: Relationships between independent variables and dairy farmer's technical knowledge: The relationships between the economic variables (daily milk production, average dairy cow and monthly income) and distance to Agricultural Services Centers weren't significantly correlative with dairy farmer's technical knowledge toward milk quality. Relationships between the variables of age, education level, dairy farming experience, social situation and measure of presence dairy farmers in extension programs were significant and positively linked with their knowledge. Table 2 show findings.

Comparing means of dairy farmer's knowledge in two levels of independent variables: The t-test used for comparing knowledge of two groups of male and female dairy farmers.

The test showed that there was significant difference between the two target groups concerning the technical knowledge toward quality milk. Among the averages of dairy farmer's knowledge that they had nonagricultural income and those who hadn't nonagricultural income, a significant difference was found. Also, there was a significant difference found between male dairy farmer's knowledge and female dairy farmer's knowledge toward milk quality. In spite of the fact that female dairy farmers have important roles in dairy farming in Iran in nearly all dairy farming activities, they had less knowledge than male dairy farmers. Limkhumduang *et al.*, 1996, stated that constraints to women contribution in dairy farming are heavy housework, low levels of knowledge and opportunity in dairy farming as well as business/cooperatives management. There wasn't a significant difference between rural dairy farmer's knowledge and urban dairy farmer's knowledge (Table 3).

Table 4: Relationship between communication channels and dependent variables (N=130)

Variables	Dependent variable	Correlation coefficient	R	Sig
Agricultural service centers	Knowledge	Kendal tau	0.139*	0.037
Veterinary organization	Knowledge	Kendal tau	0.046	0.344
Private experts	Knowledge	Kendal tau	0.106	0.119
Sellers of drugs	Knowledge	Kendal tau	0.045	0.504
Television and radio	Knowledge	Kendal tau	0.093	0.176
Family and friends	Knowledge	Kendal tau	0.053	0.432
Golpayegan cheese company	Knowledge	Kendal tau	0.259**	0.000

P<0.01=** P<0.05=*

Determine relationship between communication channels and dependent variables: Among communication channels, there was only a significant and positive relationship between obtaining information from Golpayegan Cheese Company and agricultural service centers with dairy farmers technical knowledge toward quality milk (Table 4). Hygiene promotion programs can change behavior (knowledge, attitude and practice) and are more likely to be effective if they are built on local research and use locally appropriate channels of communication repeatedly and for an extended time [11].

Experimental research

Descriptive statistics: Table 5 and 6 indicate data of microbial count and fat percentage of milk production of 12 dairy farms. Milk samples were collected in 3 continuous days (3 repeat).

A, B, C, D, E and F codes are for dairy farmers that participated in extension educational programs and G, H, I, J, K and L codes are for those who did not participate in extension educational programs. microbial count of milk samples in the first group (A,B, C, D, E and F codes) was 333,170/ml and in the second group (G, H, I, G, K and L codes) was 912,780/ml. Average fat percentage of milk samples for the first group was 3.8% and for the second group was 4.2%.

Table 5: Microbial count in milk samples (3 days)*

Code of dairy farmers	Microbial count(/ml)	Code of dairy farmers	Microbial count(/ml)	Code of dairy farmers	Microbial count(/ml)
A	1300.000	A	780.000	A	700.000
B	235.000	B	80.000	B	80.000
C	190.000	C	60.000	C	50.000
D	825.000	D	155.000	D	300.000
E	80.000	E	175.000	E	500.000
F	120.000	F	300.000	F	85.000
G	3900.000	G	2250.000	G	850.000
H	750.000	H	825.000	H	550.000
I	385.000	I	150.000	I	280.000
J	1450.000	J	950.000	J	725.000
K	440.000	K	850.000	K	550.000
L	800.000	L	450.000	L	275.000

*= 24, 25 and 26 September (2006)

Table 6: Fat percentage in milk samples (3 days)*

Code of dairy farmers	Fat (%)	Code of dairy farmers	Fat (%)	Code of dairy farmers	Fat (%)
A	3.4	A	4.2	A	4.2
B	4.3	B	4.0	B	4.1
C	3.8	C	3.4	C	3.6
D	3.4	D	3.8	D	4.0
E	3.9	E	4.3	E	3.8
F	3.2	F	4.0	F	3.9
G	3.5	G	4.7	G	4.2
H	4.0	H	4.2	H	4.8
I	4.1	I	3.9	I	4.0
J	4.8	J	5.3	J	4.8
K	3.5	K	3.3	K	3.0
L	4.4	L	4.9	L	4.6

*= 24, 25 and 26 September (2006)

Analysis of variances: Variances of normal data for measuring adjectives (microbial count and fat percentage) were analyzed by factorial design on the basis of random block model (Table 7). Just as shown in Table 7, result from the analysis of variances suggested that there was a significant difference (P<0.01) in microbial count between the two treatments (milk samples of dairy farmers that participated in extension programs and those that didn't participate in the programs). Also, there was a significant difference found between microbial counts of milk samples for all dairy farmers. In a previous study in Wisconsin dairy farms, measures of clinical and sub clinical mastitis were reduced and fewer cows were culled for mastitis at the end of the educational programs and participation in the milk quality program was pretty successful in reducing somatic cells in milk and increasing quality premiums [18].

Table 7: Analysis of variances of microbial count in milk sample

Sources of changes	df	MS	F	P
R	2	0.128	2.03	0.156
A	1	2.360	37.17**	0.000
B	5	0.658	10.36**	0.000
A×B	5	0.032	0.50	0.770
E	27	0.057		
Total	35			

P<0.01=** R=Repeat A= Treatments (trained and not trained dairy farmers) B= every dairy farmer E= experimental error A×B= reciprocal effect of treatment and dairy farmers

Table 8: Analysis of variances of fat percentage in milk sample (Factorial design)

Sources of changes	df	MS	F	P
R	2	0.003	2.84	0.08
A	1	0.012	10.09**	0.004
B	5	0.005	4.21**	0.008
A×B	5	0.008	6.87**	0.001
E	27	0.001		
Total	35			

P<0.01=** R=Repeat A= Treatments (trained and not trained dairy farmers) B= every dairy farmer E= experimental error A×B= reciprocal effect of treatment and dairy farmers

By analysis of variances, fat percentage adjective analyzed in factorial design on basis of random block model (Table8). Results indicated that there was a significant difference (P<0.01) in fat percentage between the two treatments. Therefore, Table 7 and 8 shows that participating in extension educational programs influence on microbial count and fat percentage (microbial and chemical quality).

CONCLUSION

Research result showed that the majority of dairy farmers in this study were illiterate or had low educational levels. It is worthy to note, that there was a significant relationship between the educational level and the dependent variable (technical knowledge). Therefore, extension agents and educators must give a serious attention to this problem. The majority of dairy farmers were middle-aged (more of 40 year). Therefore, extension educators and dairy professionals must develop and deliver educational programs on the basis of dairy farmer's needs. Extension workers in Agricultural Service Centers must encourage farmers to participate in extension programs and use of management guidance and practices for improving dairy production. Extension organization should also consider educational programs and training

for women dairy farmers so they can improve their quality production. Results indicated that training had positive effect on microbial count in milk and milk samples of dairy farmers. Those who participated in educational programs had less microbial count. Participation in the milk quality program was successful in reducing SPC and improving microbial quality. Educational programs in Iran are designed more on microbial quality and less attention is given to chemical quality in milk. Therefore, it is recommended that training and education programs should be considered to all aspects of quality and production, as well as providing information and knowledge on quality associated with raw milk to dairy farmers and all producers.

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