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EVALUATION OF THE GOOD FARMING PRACTICES AND THE QUALITY OF COWS' MILK OF SMALL-SCALE CATTLE FARMERS IN HALDUMMULLA DIVISIONAL SECRETARIAT AREA, UVA PROVINCE, SRI LANKA.

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Abstract : The dairy industry is a significant sector in Sri Lanka, with a longstanding tradition of producing various dairy products. Despite this, the perception of liquid milk remains low, and most dairy farming is conducted on a small scale. This study aims to evaluate the quality of milk and the implementation of good farming practices among small-scale Jersey cow farmers in the Haldummulla Divisional Secretariat Area, Uva Province.

A sample of 40 farms, selected randomly from 750 registered Jersey cow farms, was studied. Milk samples were collected and analyzed for fat, protein, lactose, and solid non-fat (SNF) content using standardized methods. Additionally, a questionnaire assessed farming practices in areas such as animal health, milking hygiene, nutrition, animal welfare, environmental management, and socioeconomic factors.

Results showed that the average milk fat content was 4.3 ± 0.95%, protein 2.66 ± 0.13%, lactose 3.97% ± 0.30, and SNF 7.2 ± 0.52%. These values were below the referenced literature values, with only 42.5% of farms meeting the minimum fat content. Good farming practices were inconsistently applied, with significant deficiencies in animal welfare and worker cleanliness. Notably, a significant correlation was found between milk fat content and cows' water intake (P=0.003) and mineral supplementation (P=0.04). The study concludes that the overall milk quality from Jersey cows in this region is subpar compared to international standards, primarily due to inadequate farming practices. Immediate interventions are necessary to enhance milk quality and educate farmers on best practices.

Index Terms **- Milk Quality, Good farming practice, Jersey Cows, Milk composition, Fat percentage**

I. INTRODUCTION

Dairy Industry is an important industry in Sri Lanka that has been existed for more than thousands of years. Though perception of Liquid milk is low among people in Sri Lanka, they prepared Yoghurts, Butter, Curd, Cheese, Gee and other value added food commodities from milk for their day today consumption. Other than few large scale farms, owned by Government, National Lives stock Development Board (NLDB) and Private Owners, usually people in Sri Lanka rare cows exceptionally to their main income in small scale level. They use milk and milk products to fulfill their daily nutritional requirements. Therefore it is an urgent social requirement to check the quality of the milk and Good farming practices to improve the milk quality. All the dairy farmers are considered as an integral part of a larger dairy food production and processing chain. Dairy farmers can play their safety role by ensuring that good dairy farming practices are implemented at the farm level. Good dairy farming practices can be discussed under following sub titles. They are animal health, milking hygiene, nutrition (feed and water), animal welfare, environment and socio-economic management. Yield and composition of milk mainly depends on Physiological and Environmental factors. Genetic makeup, Age and Pregnancy come under Physiological factors. Climate, nutritional status and management are Environmental factors. When discussing about Genetic makeup species difference, Genetic difference within species and difference between

individuals affect the milk quality. The four parameters of milk quality are Milk composition, Milk somatic cell count, Microbiological quality and Antibiotic Residues. In this study used milk was only from healthy animals. Because of that it was concerned that the milk quality only the means of milk composition. The aim of this study was to undertake a comprehensive investigation on the milk quality and the good farming practices. In this research only Jersey breed cows in small scale farms of Haldummulla Divisional Secretariat (DS) area was subjected to the evaluation.

II.RESEARCH METHODOLOGY

2.1 Research Design

This a descriptive study which was conducted to evaluate the effect of the Good Farming Practices on the milk quality by means of milk composition of Jersey cows of small scale farms in Haldummulla divisional secretariat area.

2.2 Sampling Method

Total number of small scale registered cattle farms in Haldummulla divisional secretariat area is 1200.Among the above total number of small scale cattle farms, there are 750 Jersey cows rearing farms.
All selected farms were registered farms in Huldummulla Veterinary Surgeon's office and these farms were randomly selected covering all the Gramaniladari divisions of Huldummulla divisional secretariat area. The randomly selected sample was 40 small scale farms. As a Physical feature in a large scale farm, it contains 100 or more than 100 cows *(Optimal Dairy Systems, 2017)*. In the selected sample, there are 8-20 cows in one farm which contains all breeds together and among those cows at least 4 cows were Jersey milking cows. From each farm bulk milk sample of Jersey cows was separated and subjected for analysis.

2.3 Inclusion and exclusion criteria

2.3.1 Inclusion Criteria
Farms which contain at least four (04) Jersey cows were selected

2.3.2 Exclusion criteria
Cows under treatments for any disease condition
Farms which consist of cows that were diagnosed with Mastitis and Subclinical mastitis (By California Mastitis Test –CMT)

By performing California Mastitis Test **(**CMT) on each cow it was confirmed that they are free from Mastitis and Subclinical mastitis. Here the selected animal group was in good health condition belonging to same breed (no species difference) and experienced the same climate. Milk samples were collected only in the morning session from 7am to 10am.
In this study ,the influence of other factors on milk quality namely Genetic difference within species, Age, Pregnancy, stage of lactation were considered as no effect on milk quality.

2.4 Materials

2.4.1 Lactometer

The Lactometer is used to get the Lactometer reading. This Lactometer reading is used with Fat percentage to find out Solid Non Fat (SNF) percentage of milk sample. SNF chart is used until the Fat percentage is 4.3%.If the fat percentage is more than 4.3% , the ISI formula is used to get the SNF value which gives a relationship in-between specific gravity and Fat percentage. Lactometer is calibrated at the 20^0C.Therefor each ºC above the calibration temperature add 0.2ºL; for each ºC below calibration temperature subtract 0.2 ºL from the recorded lactometer reading (*Lactoscan*,2017).

Table 1 . Correcting method of Lactometer Reading

Sample	Milk Temperature	Lactometer reading	Correction	True Reading
No.1	17^0C	30.6^0L	-0.6^0L	30.0 ºL
No.2	20^0C	30.0 ºL	Nil	30.0 ºL
No.3	23^0C	29.4 ºL	+ 0.6 ºL	30.0 ºL

2.4.2 Butyrometer

The Gerber method is the test method which is used to determine milk Fat. There Butyrometer is used to separate the fat from milk.

In the process of Gerber method first, 10 ml of sulphuric acid was pipetted into the butyrometer. Then 10.75 ml pipette was filled with milk and delivered the sample into butyrometer.1 ml of amyl alcohol was added using the 1 ml pipette and closed. The butyrometer was shaken in the shaker stand until no white particles were seen and it was inverted a few times. The butyrometer was put in the water bath for 5 min. It was taken out and dried with a cloth, put in the centrifuge, placing two butyrometers diametrically opposite, centrifuged at maximum speed for 4 minutes. The butyrometers were transferred stoppers downwards into water bath for

3-10 minutes. Lower end of fat column was brought on to a main graduation mark by slightly withdrawing stopper. The upper and lower scale readings were noted corresponding to the lowest point of fat meniscus and surface of separation of fat and acid. The difference between the two readings gave the percentage by mass of fat in milk.

2.4.3 LACTOSCAN

LACTOSCAN SP-16 (serial num.) machine of Huldummulla Veterinary Surgeon's office was used to get the Lactose and Protein percentages. Here also Fat percentage, SNF percentage can be taken. But to get more accurate data manual methods were used. This machine is annually calibrated by Analytical Instruments (Pvt) Ltd.

2.4.4.California Mastitis Test (CMT)

The California Mastitis Test is a simple indicator of the Somatic Cell Count (SCC) of milk. It works by using a reagent which disrupts the cell membrane of somatic cells present in the milk sample. The DNA in those cells reacts with the test reagent and makes a gel like formation. It is a simple but very useful technique for detecting subclinical mastitis on-farms. The CMT will only show changes in cell counts above 300,000 *(California Milk Test, 2017)*.

2.5 Method

2.5.1 Sample collection method

First udder was cleaned with clean warm water and wiped out with a clean piece of cloth. Samples were collected into sterile culture bottle and kept in ice packs during the field hours. Disposable gloves were worn while milking and collecting each sample. Each sample was measured for its milk composition namely Lactose, Protein, Fat and Solid Non Fat (SNF). Each Sample was divided into two parts since two methods are involved in the analyzing of the milk composition.

One part of a sample was checked for Protein and Lactose by using LACTSCAN and other part was sent to MILCO, Diyathalawa to get the Lactometer reading and Fat Percentage. Using the data which were collected by Lactometer and Gerber method, SNF was taken using the SNF chart. For Fat percentages more than 4.3%, ISI formula was used to find out SNF.

ISI Formula,

$$SNF\ \% = \frac{CLR}{4} + 0.22\,F + 0.72$$

SNF=Solid Non Fat

CLR=Corrected Lactometer Reading

F=Fat Percentage

Similar studies done on the evaluation of the milk composition of Jersey cows' were found on the literature and those findings were compared with the results of the current study.

An interviewer administered close ended questionnaire was used to evaluate the level of good farming practices prevailing inside the farm environment.

The questionnaire comprises questions based on the following areas of good farming practices

- Animal Health
- Milking Hygiene
- Nutrition
- Animal welfare
- Environment
- Socio-economic management

Pretest of this study was conducted by using 8 farms randomly in the Haldummulla divisional secretariat area. Milk samples were checked for its milk composition and the owner of each farm was given a self-administered questionnaire in the desired language (Tamil or Sinhala) of them. But it was noted that the answering percentage is poor. It was also revealed that the level of understanding the questions in the questionnaire was poor among the farmers since some of the farmers are illiterate in the study area. Therefore, the type of the questionnaire was changed in to an interviewer administered questionnaire.

Collected data was analyzed using the SPSS version 20 and Microsoft Excel. Average percentage values of the milk composition of the collected samples were calculated. Responses given to the questionnaire were analyzed using the Pearson Chi-Square test and the statistical significance was checked at the 95% confidence interval level to find out any relationship between the Jersey cows' milk composition and the good farming practices

III.RESULTS AND DISCUSSION

The referred literature values for Jersey cow milk Fat Percentage (%) were 5.10%,4.64%,4.38 and 4.97% and for milk Protein % were 3.70%,3.73%,3.76 and 3.30% and for milk Lactose % were 5.00%,4.90%,4.45% and 4.70% and for SNF % were 9.90%,9.4%,9.2% and 9.18%.The average percentage of the fat is 4.3 ±0.95 % and the Protein average is 2.66 ±0.13 % while lactose and SNF averages are 3.97% ±0.30 and 7.2 ±0.52 % in the studied samples. According to this none of the factors considered in the Jersey cows' milk composition in Haldummulla DS area is above the percentage values found in the referred four (04) literatures. Fat percentages of the Jersey cows' milk samples from 17 farms (42.5%) are above the minimum percentage value of 4.38% found in the referred literature. One of the farms among those 17 farms is having more Lactose percentage too than the minimum value found in the literature. That is the only farm found to have more Lactose percentage than the minimum percentage of 4.45% seen in the referred literature. None of the farms were found have more SNF or Protein percentages with compared to the

referred literature. 19 facts based on good farming practices were assessed using the questionnaire.57.50% positive responses are obtained for Animal Health practices in selected farms.53.75% positive responses for Milk Hygiene, 85.83% positive responses for Nutrition,23.75% positive responses for Animal Welfare,77.5% positive responses for Enviornment,31.25% positive responses for Socioeconomic Management are obtained. More than 75% farms are maintaining Nine (09) good farming practices (47.4%) out of the Nineteen (19) facts accessed in the questionnaire. Maintaining of the adequate space, light, ventilation and cleanliness is very poor among the farms where only two (02) farms (5%) are maintaining it up to the standard. Cleanliness of the workers is also poor in the most of the studied farms which only seven (07) farms (17.5%) are maintaining it. Statistically significant correlation is found between fat percentage and Cows' daily water requirement, the P value is 0.003 which is less than 0.05 at the 95% confidence interval. There is another statistically significant correlation between Fat and Mineral supplements with having the P value of 0.04.

The overall quality of Jersey Cows' milk is poor with compared to the similar studies in the referred four literatures in the study. Only Fat percentages of Jersey cow's milk of 17 farms from the studies sample (40 Farms) are above the minimum value found in the referred literature.SNF and Protein percentage is very low and none of the farms are producing Jersey Cows' milk with exceeding even the minimum percentage value found in the similar studies. There is a big discrepancy in maintaining the good farming practices among the studies farms where some good practices maintained by more than 75%. More than 75% farms are maintaining Nine (09) good farming practices (47.4%) out of the Nineteen (19) facts accessed in the questionnaire. Maximum number of practices maintained by the studied farm is 15 (78.95%) which is done by only one farm from the studied group. All other 39 farms are maintaining the good farming practices below 75% which is really a sad situation revels from this study.Statistically significant correlations were found between fat percentage and Cows' daily water requirement (P=0.003), fat percentage and Mineral Supplements (P=0.04).Finally this study reveals that the overall quality of the Jersey Cows' milk of small scale cattle farms is not fulfilling the international quality and also the farmers are not adequately following the good farming practices to improve the quality of their milk production. Therefore necessary actions must be taken to improve the quality of the cows' milk and the knowledge on good farming practices among the farmers.

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