

# Estimation of Cost of Production of Milk in Different Agro Climatic Zones of Sri Lanka



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## PREFACE

Livestock sector has vast potential for contributing to the economy of Sri Lanka by way of employment generation and reducing nutritional poverty of the population.

Thus, the main policy objective of the livestock is to achieve a higher level of self reliance in milk, provide livestock products in the market at affordable price for improving nutrition and promote self employment.

Dairy subsector has not shown any remarkable progress over the last two decades. Only about 30% of the country's requirement of milk is currently being produced domestically and the rest is imported mostly in the form of processed milk. The current annual bill on dairy products approximates 30 billion which is about 20% of the annual food import bill in Sri Lanka.

Therefore, dairy sector has been identified as the most priority area for development in the livestock sector. Thus, identifying current issues with special focus on economic estimates of milk production has become a necessity for development interventions in the dairy sector.

Economics and production parameters are extremely important for planning and policy formulation pertaining to the livestock sector. Responsibility of establishment of such parameters in the livestock sector lies with the Livestock Planning and Economics (LPE) Division of the Department of Animal Production and Health.

With this objective Dr. K.A.C.H.A. Kothalawala (Veterinary Surgeon/Livestock Economics) was given a responsibility of designing and carrying out a survey on cost of production of milk in different agro climatic zones of Sri Lanka in 2009.

I am thankful to Dr. Kothalwala for survey designing, coordinating, data analysis and compilation of this report in an attractive manner. The invaluable contribution made by her to make this task a success is placed on record with appreciation. Periodic surveys of this nature will be carried out in the future to update these findings.

I hope that this publication will immensely useful for policy makers, planners, and stakeholders of the dairy sector in Sri Lanka .

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15 December 2009

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generous support in farm visits and data collection.*

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## 1. INTRODUCTION

Dairying has been a year old practice among rural population in Sri Lanka. Traditionally, dairy animals have performed multiple functions of producing milk for household consumption, males as a source of draught power in agricultural operations, and dung as valuable manure. Presently, milk is a 'cash crop' for small scale dairy farmers; converting their family labour into a value added market commodity in Sri Lanka.

### *Milk Production and Marketing*

The Sri Lankan dairy industry is instrumented by a cattle population of 1.2 million and around 200,000 cattle farmers (source: *Department of Census and Statistics, 2008*). The milk is marketed mainly through formal milk market and partially through informal milk market. The formal milk market which is a private sector domain, consists of milk collecting network of MILCO, Nestle, Rich Life, Kothmale, Cargills, Fontera and few other companies. These companies are having their own chilling centers and farmer societies within the milk collecting network. In some areas where the formal market is not well developed, milk is marketed through informal milk market such as hotels, neighboring houses, etc.. Apart from that, the major part of milk in the informal market is converted in to value added products such as curd, yoghurt, milk toffees, etc... According to available statistics the formal milk collection has been 112.0 million litres and estimated milk production was 208 million litres in 2008 (source: *Livestock Planning and Economics Division, Department of Animal Production and Health*). Farmers are paid for quality (SNF and Fat %) of milk.

### *Cost of Production of milk*

The cost of production (COP) is the key determinant of farm gate price of milk, which may vary with the breeds kept, feeding systems, management system, milk marketing system, area, etc. The sustainability of the dairy industry solely depends upon the cost and the income of farming.

Dairy sector has become most prioritized area in the livestock development programs at present. Therefore, identifying current issues with special regard to economics of milk production and sustainable dairy development plans are urged for the dairy sector. The reliable data on cost components and cost of production of milk is deficient for present planning activities. Thus estimation of cost of production of milk in different agro climatic zones is extremely useful in most of the dairy development programs.

*Objective of the study*

On this background, a survey was conducted by the livestock planning and economics division of the Department of Animal Production and Health (DAPH) in 2008 with an objective of estimating the cost of production of milk under different production systems in different agro climatic zones in Sri Lanka.

This report presents findings of this survey.

## 2. METHODOLOGY

This chapter consists of description of the area, sampling procedure and type of data collected for this study.

### 2.1 Time Frame

This survey was conducted during the period of June to December ,2008 .

### 2.1 Area of the study

The study was conducted in eight (08) districts viz. Kurunegala, Puttlam, Hambantota, Anuradhapura, Nuwara Eliya, Kandy,Gampaha, Matale representing following agro climatic zones of Sri Lanka .

Coconut Triangle	- Kurunegala, Puttalam
Dry Zone	- Hambantota, Anuradhapura
Hill Country	- Nuwara Eliya
Mid Country	- Kandy
Wet Zone	- Gampaha, Matale

### 2.2 Sampling procedure

A total of 623 households were interviewed and data were collected. Multistage random stratified sampling procedure was the method of use.

### 2.3 Data collection

Data were collected using a pre structured questionnaire.

#### 2.3.1 *Type of Data collected*

Socio economic profile of the respondents (name, address, income, expenditure, income sources, education ) together with herd structure , milk production, were collected through this questionnaire.

### 2.4 Data Analysis

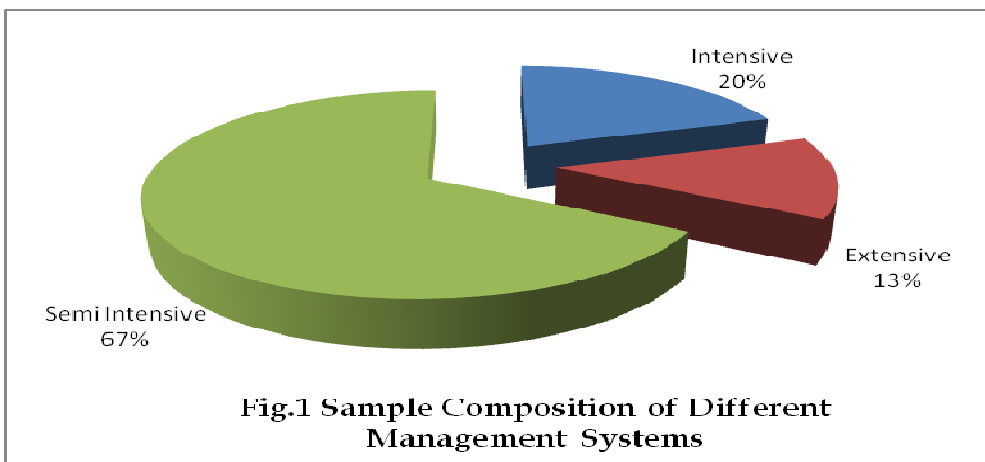
Data were categorized according to main agro climatic zones and management systems. Microsoft excel was used for tabular analysis.



### 3. RESULTS AND DISCUSSION

The results of the survey are presented in this section. COP of milk shows significant variation with the management system even within the same agro climatic zone. Therefore, results were presented in management systems mainly.

#### 3.1 Sample Profile



The selected sample (623) was comprised with the majority (67%) in semi intensive system, 20 % in intensive system and 13% in extensive system farms (*Figure 1*). According to the profile it was clear that the semi intensive management practice was common in all the districts. Extensive management system was not found in Nuwara Eliya (Hill country) ,Kandy and Gampaha districts and intensive management system was also common in all districts except in Puttalm according to the sample (*Table 1*).

#### 3.2 Farm Profile

##### 3.2.1 Herd Size

Average number of animals per farm in extensive system was 64.2 with a minimum of 11 in intermediate herd size to maximum of 485 in large herd size. The average herd size was 4.96 and 7.20 in intensive and semi intensive management systems respectively. Although the large herd sizes (more than 50) were found in semi intensive systems in some agro climatic zones , herd sizes were found to be small to intermediate (11-50 animals) in intensive management systems (*Table 1 and 3*).

**Table 1: Farm Profile of Three Different Management Systems**

Parameter	Intensive	Semi intensive	Extensive
Average farm size (No.of Animals)	<b>4.96</b> (2-17)	<b>7.20</b> (2-180)	<b>64.20</b> (11-485)
Milking cows / Total animal ratio	<b>0.44</b> (0.1-0.8)	<b>0.36</b> (0.06-1)	<b>0.24</b> (0.1-0.8)
Milch cows / Total herd ratio	<b>0.73</b> (0.3-1)	<b>0.66</b> (0-1)	<b>0.63</b> (0.1-0.8)
Average milk production (farm/day) l	<b>14.20</b> (2.5-92)	<b>12.40</b> (1.5-78)	<b>13.90</b> (2.0-40)
Av. milk production (milking animal/day) l	<b>8.3</b> (2.5-22)	<b>5.1</b> (0.5-12)	<b>1.6</b> (0.8-6.2)

*Range between minimum to maximum is indicated in parenthesis*

### 3.2.2. Milking Cows to Total Animal Ratio

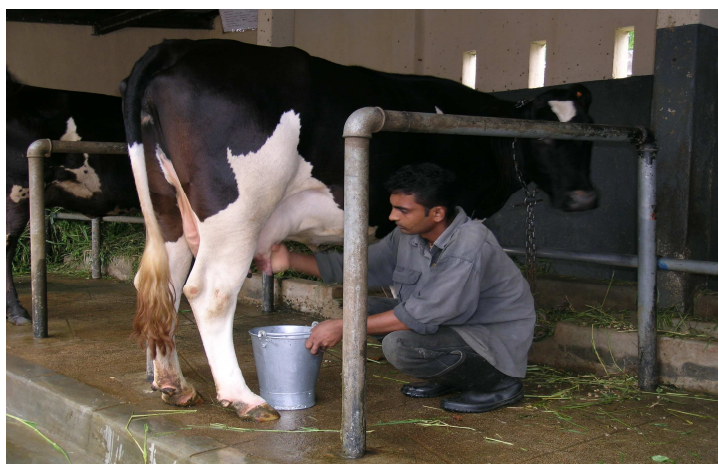
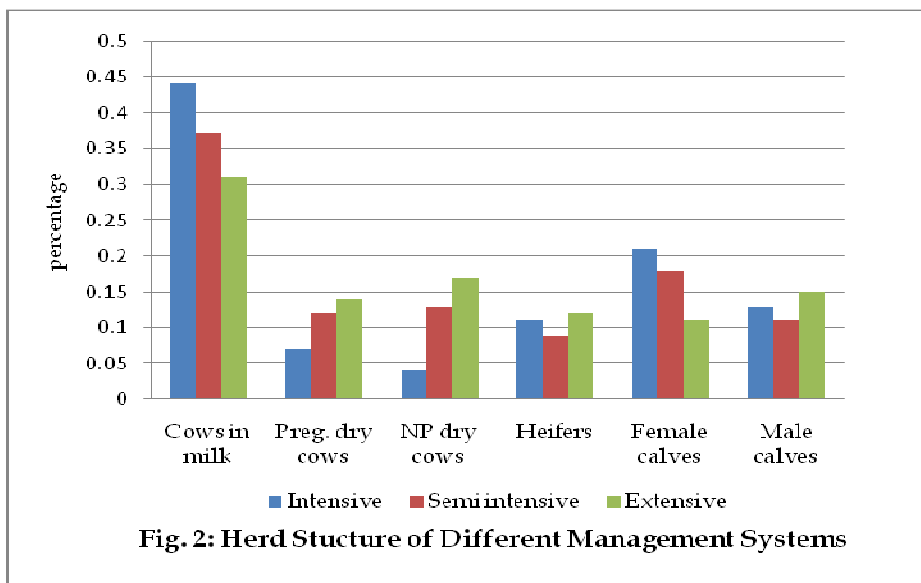
Milking animals to total animal ratio is an important parameter that has a significant correlation with cost of production of milk. The ratio below 0.5 in all three systems indicates more than the 50% of the animals are at non milking stage in survey period in all herds. According to the minimum ratio of milking to total animals it was shown that there had been only 10% of milking cows in the total herd in some farms in the sample in all three systems. This value has to be over 50% to maintain the COP at reasonable level to gain profits in dairying.

### 3.2.3. Milch Cows to Total Animal Ratio

Milch animals are defined as the animals having potential of milking or once calved. This parameter too is important with regard to economics in a farm. The group of milch animals comprise of cows in milk, pregnant dry cows and non pregnant dry cows.

Milch to total animal ratio was highest (0.73) in intensive system with the range of 0.3 to 1. It was 0.66 and 0.63 in semi intensive and extensive systems respectively (*Table 1*).

The low percentage of non pregnant dry cows and relatively high percentage of heifers and female calves in intensive systems might be due to the good breeding management practices in the intensive system compared to other two systems (*Figure 2*).



*Picture: 1 Milk Production under Intensive Management System*

#### 3.2.4. Average Milk Production per Farm per Day

Average milk production per farm per day has not shown much variability among three management systems. It was 14.2 l , 12.4 l and 13.9 l in intensive, semi intensive and extensive management systems respectively. The range between minimum to maximum shows the existence of high producing farms ( 92 l) as well as farms with very little amount of milk per day as 1.5 l ( Table 1) in three systems.

### 3.2.5. Average Milk Production per Animal

Average Milk production per animal was highest (8.3 l/day) in intensive system and least in (1.6 l/day) in extensive management system. This could be explained by presence of high bred cattle viz. Jersey, Friesian in most of the intensive management systems irrespective of agro climatic zone. Unlike in the intensive system local crosses are reared in the dry zone of Sri Lanka under extensive management system in which average milk production per cow per day was very low. The average milk production per animal per day in semi intensive system was 5.1 liters per day. There were high yielders with 22 litres of milk per cow per day in intensive system (eg. Nuwara Eliya district). There were medium level producers as 12 litres per animal per day in semi intensive system too (*Table 1*).

It was noticed that there were animals with milk production of 6.2 litres per day under extensive management systems though the average yield was very low (*Table 1*).

The interesting feature that has been observed was that the per animal milk production range between minimum to maximum was very wide indicating animals are not producing at their optimum capacity. Therefore, it is obvious that there is a massive potential of increasing average milk production of animals in above systems by improving management practices.



*Picture : 2 Extensive Dairy Herd in Hambantota Area*

### 3.3. Cost of Production of Milk in Different Agro Climatic Zones

#### 3.3.1 Average cost of Production of Milk

The average cost of production of milk in the area depends upon the common management system adopted (intensive, extensive, semi intensive), availability of by products, milk marketing net work etc.. The production of milk in the dry zone is less expensive in all three management systems compared to all other zones in the country (Table 2).

**Table 2: Cost of Production of Milk in Different Agro Climatic Zones by Management System (Rs/litre )**

Zone/District	Sample size	Average COP	Management System		
			Intensive	Semi intensive	Extensive
<b>Coconut Triangle</b>	<b>163</b>				
Kurunegala	94	22.49	25.19	21.62	11.89
Puttlam	69	14.50		17.70	9.50
<b>Dry Zone</b>	<b>136</b>				
Hambantota	44	10.81	22.85	11.39	8.94
Anuradhapura	92	14.67	23.80	17.64	9.52
<b>Hill Country</b>	<b>134</b>				
Nuwara Eliya	134	27.25	29.85	22.38	
<b>Mid Country</b>	<b>68</b>				
Kandy	68	25.80	29.40	24.8	
<b>Wet Zone</b>	<b>122</b>				
Gampaha	58	23.60	26.57	23.52	
Matale	64	18.85	22.13	17.79	12.05
<b>All island</b>	<b>627</b>	<b>22.10</b>	<b>27.80</b>	<b>22.53</b>	<b>10.86</b>

The average COP of a litre of milk in hill country is recorded as the highest (Rs.27.25/l) and that of in Dry zone (Hambantota ) is recorded as the lowest (Rs.10.81/l). The results revealed that the production cost of milk in the agro climatic zone is heavily dependent upon the common management system adopted in the area. It is evident that the COP of milk in Hill country where the common management is intensive is high. In contrast to that the average COP of dry zone is low. It was clear even within the same agro climatic zone (Coconut triangle and Wet zone) the COP varies dramatically. The Table 2 shows the COP in the coconut triangle varies from Rs. 14.50/l in Puttlam (where extensive management is predominant) to Rs.22.49/l in Kurunegala where intensive and semi intensive systems are predominated.



Picture 3: Dairying in Coconut Triangle

### ***3.3.2 Cost of Production of Milk in Different Management Systems***

Table 2 clearly depicts that the COP is highly influenced by the management system than the agro climatic area. It was clear that rearing cattle under intensive system is most expensive and keeping under extensive system is highest profitable. Average milk production cost is highest in Nuwara Eliya (Rs.29.85/l) district where the predominant management system is intensive. It was least expensive in Hambantota district where the main rearing system is extensive.

Managing cattle in semi intensive system is also less expensive as well gaining higher profits.

### ***3.3.3 Cost of Production of Milk in Different Scale of Operation***

The milk production is influenced by the herd size too. The COP of milk within the same management system shows significant variation (*Table 3*). In small scale operations (< 5 animals ) under intensive management system the COP of milk was Rs. 28.50/l and it has decreased up to Rs. 16.30/l with intermediate size (11-50 animals) of operation ( The large scale operations under the intensive system were not present in the tested sample).

Similarly, the COP of milk has varied from Rs. 21.70 to 11.50 from small scale to large scale of operation in semi intensive system. The production cost variation between intermediate to large was not significant in extensive management system (Table 3).

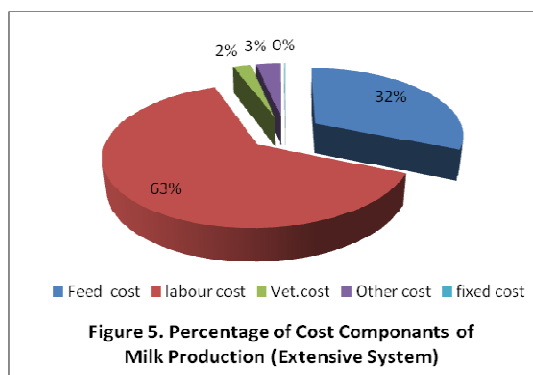
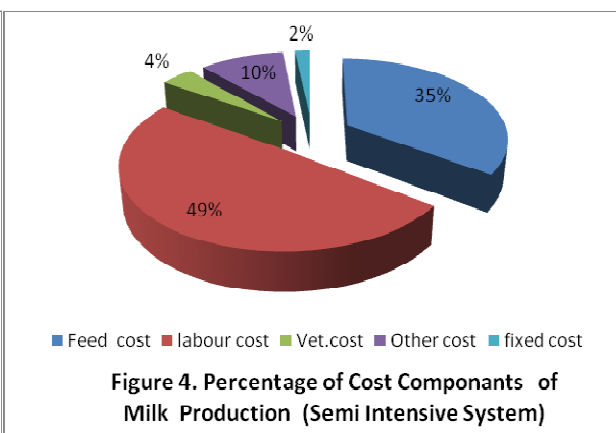
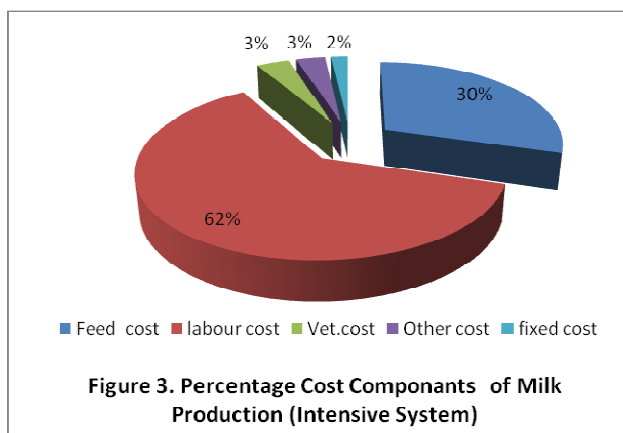
**Table 3. Change of Cost of Production of Milk According to the Herd Size in Different Management Systems**

Scale of Operation	Intensive	Semi intensive	Extensive
	COP Rs/l	COP Rs/l	COP Rs/l
Small (< 5)	28.50	21.70	
Medium (6-10)	24.70	18.97	
Intermediate (11-50)	16.30	15.84	10.34
Large (> 50)		11.50	8.24

### 3.4 Cost Component of Milk Production

#### 3.4.1 Labor Cost in Milk Production

Labour cost is the main cost component of milk production in all three systems (Figure 3 - 5). It is 62 % and 63 % in intensive and extensive systems and 49 % of semi intensive system respectively.



The labour cost for producing one litre of milk shows significant difference across the management system (Table 4). It was Rs. 17.22 , Rs.11.13 and 6.85 in intensive, semi intensive and extensive management systems respectively.

**Table 4: Cost of Different Components of Milk Production under Different Management Systems**

	Intensive	Semi intensive	Extensive
<i>Sample size(n)</i>	218	307	98
Feed cost (Rs)	8.23	7.89	3.40
Labor cost (Rs)	17.22	11.13	6.85
Veterinary cost (Rs)	0.97	0.85	0.25
Other cost (Rs)	0.87	2.25	0.35
<b>Total variable cost (Rs)</b>	<b>27.29</b>	<b>22.12</b>	<b>10.85</b>
<b>Fixed cost (Rs)</b>	<b>0.51</b>	<b>0.40</b>	<b>0.01</b>
<b>Average COP (Rs/l)</b>	<b>27.80</b>	<b>22.52</b>	<b>10.86</b>
<b>Average Output/Input Ratio</b>	<b>1.2</b>	<b>1.7</b>	<b>3.3</b>
<b>Average Farm gate price of milk Rs/l</b>	<b>28.25</b>	<b>30.50</b>	<b>32.65</b>

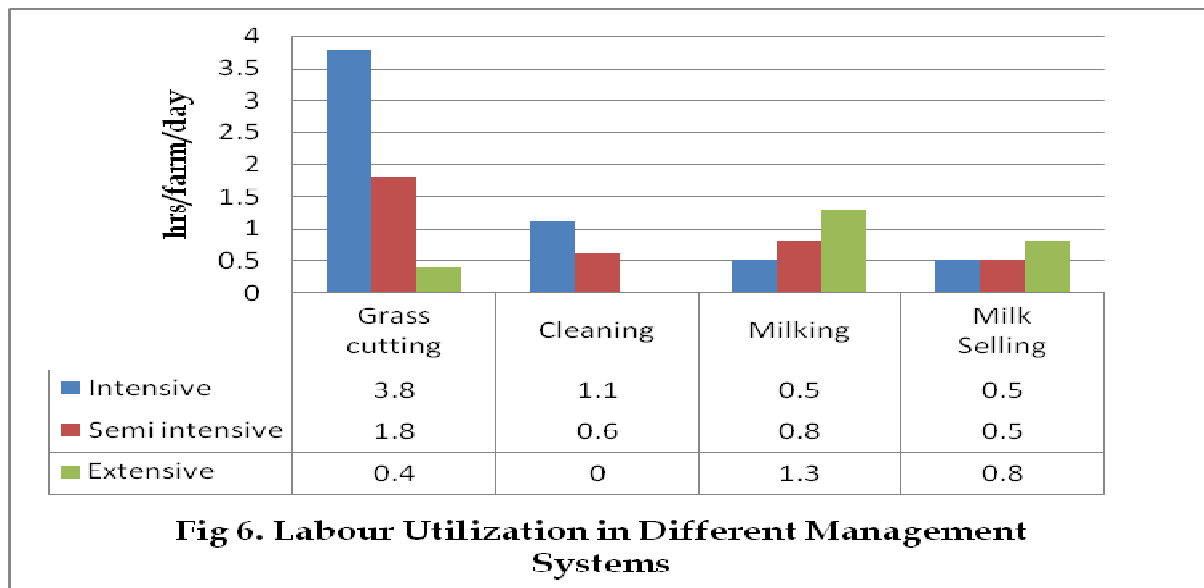
The pattern of labour utilization also shows a variation within management system (Figure 6). On an average 5.9 labor hrs per day were spent on dairying in intensive system whereas 3.7 and 2.5 labour hrs per farm per day were spent in semi intensive and extensive management systems respectively.

The activities of grass cutting ( 3.8 hrs/day) and cleaning (1.1 hrs/day) were the most prominent in intensive system. On an average 0.8 hrs per day per farm for milking was spent in semi intensive system according to this survey. The longest time needed for milking was 1.3 hrs /day per farm under extensive system.



The percentage of labour cost to the total cost of milk production was also shows variation among three management systems. It was 62%, 49% and 63% in intensive, semi intensive and extensive management systems respectively (*Figure 3-5*). It is clear that the labour involvement is comparatively lower in semi intensive system than other two systems.

Further, the lower percentage of labour in semi intensive management system compared to other two systems could be explained by high percentage of cost under other cost component (miscellaneous cost) which is mainly for ropes for tethering in this system.



### 3.4.2 Feed Cost in Milk Production

Feed cost is estimated based on cost incurred on concentrate, by products and minerals used for feeding .The cost on grass has been included under labour cost.

Feed cost is the second highest cost component of milk production. The percentage of feed cost falls in to the same range (30-35 %) in all three systems (*Figure 3-5*). The feed cost per litre was highest (Rs. 8.23) in intensive system and lowest in (Rs.3.40) extensive system (*Table 2*).

### 3.4.3 Fixed cost in Milk Production

Fixed cost is calculated based on interest and depreciation of cattle shed and equipments.

Neither depreciation nor appreciation is taken in to consideration on animals in calculation. Since the total herd is not only for milking purpose in extensive system the interest on herd is also not taken in to consideration.

The highest fixed cost was reported in intensive system (Rs. 0.51 /l) followed by semi intensive system (Rs. 0.40/l) while least fixed cost was in extensive system (0.01/l). It is evident that the fixed cost is very little in extensive system with large herds maintaining in paddocks only at night when compared to other two systems (*Table 4*).

The fixed cost was only 2% of the total cost in insensitive and semi intensive system and it was closer to zero (0%) in extensive management system.

#### ***3.4.4 Total Cost of Production of Milk***

The cost of production of milk shows vast difference among management system (*Table 2*). The COP is highest in intensive management system (Rs.27.80/l) while lowest (Rs.10.86/l) in extensive management system. According to this study milk production cost is nearly three times higher in intensive management system compared to extensive system.

#### ***3.4.5 Farm Gate Price of Milk***

According to the survey, farm gate price in intensive system was lowest (Rs.30.25) whereas it was highest in extensive system with Rs.32.65 per litre (*Table 4*). The higher farm gate price in extensive system could be explained by breeds kept (i.e. tropical breeds) and high level of roughage feeding resulting high percentage of fat and SNF in milk.

#### ***3.4.6. Milk Marketing Net Work***

It was observed that there is no unique system of purchasing milk at farm gate. Some companies pay for quantity (volume) and some companies pay for quality. Moreover, milk is not tested for quality (for Fat % and SNF %) in front of the farmer. In some cases rejection of morning milk due to bad quality is notified in the evening. There was no minimum farm gate price for milk. As a result in most places farmers do not seem to be satisfied about milk collecting net work ..

#### ***3.4.6 Output Input Ratio of Milk Production***

Output input ratio is an efficiency indicator of any production system. It is the ratio between the costs of all possible inputs to the value of outputs. Although the dung and value of calf are valuable outputs from dairying it was not taken into consideration in this estimation. The highest output input ratio was reported in extensive system (3.3) and the least in intensive system (1.2) according to the study (*Table 4*).

## 4. Conclusion and Recommendations

### 4.1 Conclusions and Recommendations

The production cost of milk significantly varies with different agro climatic zones, management systems, scale of operations and herd structure ratio.

The average cost of production (COP) of milk ranged from Rs.10.86 /l to Rs.29.25/l across the different management systems. The COP was higher in hill country where the intensive management system is predominant and lower in dry zone areas where the extensive management system is prominent. Thus it is obvious that the milk production cost varies according to the management system even within same agro climatic zone. Accordingly **potential areas for dairy development may possibly be identified to implement dairy development plans.**

On an average the COP was Rs.22.10 per litre of milk that is marginally lower than the average farm gate price of Rs.23.05 per litre in all over Sri Lanka gaining marginal profit . Therefore, it could be concluded that small scale farmers are converting their labour as a market commodity through dairying. **This fact shows the limitation in development of dairying as commercial production ventures in Sri Lanka. It is essential to draw up plans to reduce cost of production of milk and increase farm gate price of milk in the formal milk market.**

Milk marketing net work and paying system could be restructured with a **standard paying system and a minimum purchasing price at farm gate based on periodic review of COP** to increase price for milk. That would lead to avoid unnecessary competition among milk collecting agencies too.

Cost for labour (opportunity cost for family labour ) in milk production is very high compared to other cost components. Major portion of the labour cost is allocated for grass cutting. Therefore, small scale pasture plots with improved grass varieties in farm yard or nearby would minimize this cost component significantly.**This fact should be considered essentially in developing dairy development plans.**

Since there are animals with high producing capacity in intensive and semi intensive systems there is a potential of increasing per animal milk production thereby reducing the production cost of milk.

**Dairy development plans with comprehensive extension packages (with management tools viz. breeds, herd composition, management system, pasture development ,disease control ) for identified potential areas combined with strong marketing net work and restructured paying system is recommended for the white revolution in Sri Lanka.**

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