CHAPTER 7

SUMMARY AND CONCLUSIONS

This chapter concludes the entire research work. It discusses major findings, contributions, inherent limitations, and the scope for further research.

7.1 Summary

The objective of this research is to improve the performance of co-operative dairy situated in Varanasi (India) through assessment of customers' needs and distribution cost reductions. Literature review suggests that the topic has been studied comprehensively for large dairies, but there is less research work reported for small and medium dairies in the context of Indian co-operative dairy.

The literature suggested that understanding customers' requirements is essential for an organization. Deng et al. (2010) showed that customer satisfaction can be strengthened by product quality, customer preferences, customer perception, customer value and services provided to the customers. The problem is more complex in case of food products (Furst et al., 1996). Packing (Gelici-Zeko et al., 2013), perceived health benefits (Jones et al., 2008) and various other factors are involved in influencing customer preferences (Boniface and Umberger, 2012). It is, therefore, important to gather data on customer opinions and analyse them to draw conclusions about customer preferences.

The co-operative dairy, being a state-owned dairy does not support marketing activities to the extent that it should do. The advertisement budget is less than 0.2%, which is far too less for as compared to other dairy which spent 5-10% of their revenue. Therefore, it contributes to less awareness of the dairy products. Though, the co-operative dairy supplies fresh milk (local

milk farmers of Varanasi region) as compared to a leading brand, this fact is hardly known to the target customers.

The milk price of the co-operative dairy under study has well-defined price range with price linking to reputed brands, but the perception of the co-operative dairy is not prudent. A slight drop in price would lead to increase in demand as customers are highly price sensitive. With the pilot study information, the following objectives were framed:

1. Assessing the target market, customers' buying behaviour and to know the needs of consumer for the co-operative dairy a survey needs to be done.
2. Preparing a marketing plan for the co-operative dairy with focus on promotional and selling side of the business.
3. Formulating a distribution model to minimize transportation cost through Vehicle Routing Problem (VRP), and search for the better solutions.

7.2 Conclusions

The above objectives were carried out in the following way and the conclusions are reported.

1. **Assessing customer preferences, requirements, and perceptions of co-operative dairy**

   The first part of the thesis deals with a questionnaire 'Preferences for Milk and Milk Products'. The response from 600 consumers were taken and the customer requirements and preferences were identified by statistical analysis. These identified preferences were used as 'WHAT's' of the customers' requirements are in House of Quality (HoQ). The 'Technical Requirements' were suggested by the experts, which would cater to the customer requirements.

   House of Quality (HoQ) identified three important factors.

i. Market Planning (Promotion/ Advertisement)

ii. Reduction in distribution cost

iii. Product expansion

Next, with the help of experts the three attributes cost, quality and availability are selected to identify the customers' perception towards the co-operative dairy under study. MDS (Multi-Dimensional Scaling) method was used to position the dairy with its competitors on the basis of three attributes. MDS (Multi-Dimensional Scaling) result shows that a leading brand (AMU) is distantly positioned in term of quality, cost and availability perception. The other remaining brands form a close cluster, but the co-operative dairy under study PRA is also distantly located from the SHU, which is next to AMU in the brand group. The result suggests that the corporate dairy under study need to work on the factors, which is quality, cost, and availability, to improve their falling market share. MDS indicated that the co-operative dairy lags with competitors.

Therefore, the conclusions from the first chapter are:

- The co-operative dairy under study needs market planning, lower distribution cost and product expansion.
- Results from the statistical analysis also indicates that most of the young consumers are not aware about the cooperative dairy and their products. So, the co-operative dairy needs some focus towards market planning.
- Multi-Dimensional Scaling (MDS) shows that the co-operative dairy under study is behind from its competitor in terms of cost, quality and availability.

2. Achieving competitive advantages for co-operative dairy through market planning

As indicated by the finding of the House of Quality (HoQ), this chapters deals with the market planning, keeping marketing aspects of 4 p; product, plan, price, and promotion. Focus has been given to especially low- cost promotion to cut down the cost as identified by the MDS (Multi-Dimensional Scaling). To plan the low cost advertisment , three attributes were taken i.e. cost, reach and effectiveness. Here, the cost means the cost of advertisement on per day basis, which has kept being low. The reach is the number of people get exposed with an identified channel. The effectiveness is a degree to which people will convert it into sales.

From experts a total seven advertisement channels were listed i.e. Social Media, Advertisement on the back side of auto rickshaw (Auto Back), e-mail, FM Radio, Billboard, Newspaper Inserts and TV. Using Analytical Hierarchical Process (AHP) the following low-cost advertisement channels are selected.

i. Social Media,
ii. e-mail
iii. Newspaper Insert

Later, a conceptual production-inventory model was developed which captures the time behaviour of sales with increase in market budget allocation. The conceptual framework supports the idea that increase in budget supports the growth in sales, hence gives profit to co-operative dairy. The conclusions from this part of the research work are:

- Three attributes cost, reach, effectiveness are the main aspects for low-cost advertisement.
- With the help of proper market planning the co-operative dairy under study can get more exposure to their consumers.
- With the help of production-inventory model the effect of budget allocation can be observed throughout the time-period.

3. Minimisation of distribution cost using Centre of Gravity (CG) Method

With the aim of reducing distribution cost of the co-operative dairy, A Vehicle Routing Problem (VRP) model was developed with the constraints like time window, vehicle capacity and demand matching. A two-step procedure was used. First, stockist points were identified by locating the Centre of Gravity (CG) point of that route and then a suitable cluster were obtained by the VRP model. In the original policy the company used one vehicle for each of the seven routes. With Vehicle Routing Problem (VRP) it was replaced by four vehicles to serve the four clusters of stockists, one vehicle per cluster. After identifying the stockist, the optimal sub routes for serving the nearby retailers were again identified by running the Vehicle Routing Problem. In addition to this, one-time storage capacity was provided to these stockists by the co-operative dairy to cut down the number of trips from existing two to one. The original distribution cost of the co-operative dairy was calculated and compared with the cost obtained for optimised clusters, giving a substantial saving of 17.09% per day for the co-operative dairy.

4. **Minimisation of distribution cost using k-means Clustering and Cheapest Link Algorithm (CLA) Method**

   To explore further reduction in distribution cost, the new routes identification is done by using Capacitated Clustering method and Capacitated Vehicle Routing Problem method. The k-means clustering was used to create clusters with distance and demand, which generated evenly sized clusters. Then, the CVRP was solved with Cheapest Link Algorithm, using python programming for the depot to cluster centres and for the clusters centre to small retailer. This approach led to a reduction of 22.35% in distribution costs per day as compared to original cost, resulting in significant savings.

Table 7.1 shows the comparative cases using points 3 and 4 with the existing policy of co-operative dairy. For the following table, the higher capacity (2700 litres) vehicle is paid 25

INR/KM and smaller capacity (500 litres) is paid 20 INR/KM. The labour cost for higher capacity vehicle is 300 INR/ day and for smaller capacity vehicle is 100 INR/day.

Currently the co-operative dairy is paying 1.3 INR/ litres for seven higher capacity vehicles for the seven distribution routes. The Case 1 is original plan of the co-operative dairy where the total distance travelled by the vehicles are approximately 330 KM/day. The labour cost for seven higher capacity vehicles was calculated 5600 INR/day. Therefore, the total cost will be (330 X 25) + 5600 = 13850 INR/day for original policy of co-operative dairy.

Table 7.1: Comparative Cost Using Original Policy, CG Method and K-Means Clustering & CLA Method

Case	Original Policy	Centre of Gravity	K-means clustering & CLA
Total Cost	13850 INR/day	11091.5 INR/day	10,387.46 INR/day

Therefore, from last two chapters the conclusions are:

- Using optimized cluster, the co-operative dairy under study can lower the distribution cost almost 17.09% of the original cost.
- It can also be seen that using new routes can be helpful to reduce the total distribution cost.

7.3 Limitations and Future Research

For this study, the data collection is done in Varanasi including the locality of Banaras Hindu University. The samples are from different age groups, gender, and income background. As the students at Banaras Hindu University (BHU) participated more, therefore, there are chances of biasness in the method.

The Vehicle Routing Problem (VRP), described in Chapter 5, used LINGO software with the approach of Centre of Gravity (CG) method. While in Chapter 6, the PYTHON programming

language is used to solve a heuristic approach the k-means clustering and Cheapest Link Algorithm. Here, the heuristic approach was used which gives the sub-optimal results with less time. There are chances to get better results with the help of usual optimization method using LINGO or GRUBI software.

Future Scope

The co-operative dairy under study is a small business and confined into a city only. The research can be extended for other bigger dairies. Currently research has not focused on demand generation or exploring new areas in the city especially in the walled city. There are certain locations where co-operative dairies do not deliver milk and needs to be explored.

It was found that product expansion was also one of the important factors, that can improve the current situation of co-operative dairy. During the studies, it was also noticed that the co-operative dairy is overstaffed and, therefore, needs to relook into this problem. A new higher capacity plant is being constructed, replacing the old one will help to improve the demand and quality of milk (i.e. smell and taste). With the higher capacity plant, the co-operative dairy can think about relocation, which can help to reduce their transportation cost from both distribution and procurement sides taken together.