

Composite Performance Analysis of Milk Producer Cooperative Societies in the SHIMUL Jurisdiction of Karnataka

Santhosha, K.M.¹, G.M. Gaddi², C.G. Yadava³, B.M. Shashidara⁴ and Gagana, M.D.⁵

¹Department of Agribusiness Management, University of Agricultural Sciences, Dharwad, Karnataka, India

²Department of Agricultural Economics, University of Agricultural Sciences, GKVK, Bengaluru, Karnataka, India

³Department of Agricultural Economics, College of Horticulture, UHS, Bagalkotte, Karnataka, India

⁴Department of Agricultural Marketing, Coop and Agribusiness Management, UAS, GKVK, Bengaluru, Karnataka, India

⁵Department of Agricultural Economics, University of Agricultural Sciences, Dharwad, Karnataka, India

*Corresponding author: santhoshkm347@gmail.com

Received: 19-03-2022

Revised: 29-05-2022

Accepted: 05-06-2022

ABSTRACT

India is the largest producer of milk in the world, with an annual production of 176.3 million tonnes in 2017-18. The study pertained to Shivamogga Milk Union Limited (SHIMUL), which was established in 1987 with its operational area spreading over Shivamogga, Davanagere, and Chitradurga districts in the state of Karnataka. There are 1061 co-operative societies in the area of operation of the Union with a farmer membership of 1,38,444. The Union presently procures 2.12 lakhs liters of milk per day and sells 1.48 lakhs liters of milk per day, and the remaining milk is used for the manufacture of value-added products of milk. Findings of the study on the Composite Performance Index (CPI) used to assess the performance of Milk producer co-operative societies (MPCS) in the jurisdiction district revealed that the performance of MPCS's in Shivamogga was the best, followed by MPCS's in Davanagere, and Chitradurga based on the magnitude of performance indices. Therefore, the Union needs to pay more attention to the infrastructure needs of MPCS's in these districts and extend better facilities to members.

Keywords: SHIMUL, MPCS's, Composite Performance Indices

India is the largest producer of milk in the world, annual production of 176.3 million tonnes in 2017-18, and possess the highest livestock population as well (Anonymous, 2018). The milk production comes from cows (43%), buffaloes (53%), and goats (4%). The Dairy industry in India has made rapid progress since independence with the growth of many modern milk plants and product factories. These organized dairies have been successfully engaged in the routine commercial production of pasteurized bottled milk and various value-added dairy products. The milk

processing market in India is expected to grow at a CAGR of 20.5 percent during the last part of the 2020s. The rapid growth in milk supply and modernization of dairy is mainly attributable to the dairy co-operatives under the Operation Flood Project, assisted by many multilateral agencies

How to cite this article: Santhosha, K.M., Gaddi, G.M., Yadava, C.G., Shashidara, B.M. and Gagana, M.D. (2022). Composite Performance Analysis of Milk Producer Cooperative Societies in the SHIMUL Jurisdiction of Karnataka. *Agro Economist - An International Journal*, 09(02): 151-155.

Source of Support: None; **Conflict of Interest:** None



like the European Union, the World Bank, Food and Agriculture Organization, and World Food Program. The National Dairy Development Board is a premier institution to accelerate the pace of dairy development on cooperative lines in the country through various phases of Operation Flood, which enabled the needed infrastructure for regular milk procurement. Facilities created also enabled better veterinary first-aid health care services to their producer members. The milk producers of the village, with the support of the milk union, formed a village Milk Producers Cooperative Society (MPCS), which formed the Milk Producer's Union.

Karnataka ranks 9th in the country with about four percent in milk production. The Shivamogga district ranks at the same spot in milk production with a contribution of 3.81 percent among the districts to the total state milk production. The Shivamogga Milk Union Limited (SHIMUL) was established on the AMUL pattern with the main objective of socio-economic reformation of the farmers. Agriculture labors and other needy persons in the rural areas, through dairying, supply quality milk, and milk products to consumers of the union area. The milk collected would be brought to dairy and processed before being packed in various sizes and further routed to consumers through its retailer network.

The SHIMUL has 1061 functional Dairy cooperatives spread over its three jurisdictional districts with 1,38,444 producer members through MPCS's as on 31-03-2016. The Union pays a remunerative price to producers for milk, including supply of feeds and technical services at subsidized rates. Union has a retailer base of 1160 spread over three districts, which helps to sell 1.9 lakh liters of milk and milk products daily. Under the aegis of the Government of Karnataka (GoK), the program "Ksheerabhagya" to provide Milk to the school children is successfully channelized by the Union. The present paper aims to classify the jurisdiction of SHIMUL according to dairy performance indicators using the data collected from sample MPCSs.

MATERIALS AND METHODS

Shivamogga is one of the vital milk contributing districts to the Karnataka's Milk production. The Shivamogga milk union was purposively selected for the research study. Five milk Producer Dairy

Cooperative Societies (MPCS's) from each of the three districts representing the SHIMUL jurisdiction were selected randomly. The data on various parameters like membership, daily milk procurement, cattle feed distributed, vaccination services, profit on milk sale, loans disbursed to members were collected from the records of chosen MPCSs about the year 2018-19.

Composite Index Analysis

The multistage Principal Component Analysis (PCA) was used to construct indices for each of the six chosen performance indicators and to construct the overall Composite Performance Index (CPI). Six of the performance variables, i.e., milk procurement, cattle feed distribution, vaccination, membership, profit on milk sale, and loans to members, were used. The normalized values of milk procurement, cattle feed distribution, vaccination and membership, profit on milk sale, and loans to members have to be done in order to make it unit less. Finally, the overall CPI was constructed to get a clear picture of the performance of the SHIMUL and to compare the performance across the groups. The cumulative square root frequency method on the constructed indices was used to categorize the MPCS's into three groups, viz., poor, average and good for each of the indicators considered.

The construction of a composite index to compare the MPCS's in terms of their performances has two basic steps: Firstly, elimination of scale bias in indicators, and secondly, determination of proper weights to be assigned to different indicators. In this study, each of the indicators was normalized by subtracting the minimum value of the indicator from its actual value and then dividing it by the range, which is the difference between the maximum and minimum value of the selected indicator. Once the bias of scale is removed from the observations, the next task is to assign appropriate weights to the selected indicators. Assignments of arbitrary weights on independent judgment are exposed to subjectivity and should be resorted to only as the last option. Therefore, in this analysis, the weights of individual indicators have been assigned on the basis of principal component analysis. However, the main argument here is that it maximizes the sum of squares of correlations (of the indicators with the composite index). The Statistical

Package for Social Sciences (SPSS) has been used to perform PCA. The steps of PCA are given below:

1. Run PCA using SPSS to obtain Factor Loadings and Eigen Values.
2. The Initial Eigen Values above 'one' are identified. According to the number of Eigen Values more than 'one', the same numbers of components are extracted for each variable as shown in the rotational component matrix.
3. Then, the extracted component matrix is multiplied by the Eigen Values, i.e. the 1st Eigen Value is multiplied with the 1st extracted component column and 2nd Eigen value is multiplied with the 2nd extracted component column, considering only absolute values.
4. The values obtained are added of each indicator to get weight for that particular indicator. Similarly, weights are obtained for other indicators, too. Then the Grand Total Weight was obtained by summing up all the weights.
5. The normalised value of each indicator is multiplied by its respective weight. Then the sum of each multiplication is divided by the Grand Total Weight to obtain the index. The formula used to determine the index is:

$$I = \frac{\sum_{i=1}^n X_i \left[\sum_{j=1}^n |L_{ij}| E_j \right]}{\sum_{i=1}^n \left[\sum_{j=1}^n |L_{ij}| E_j \right]}$$

Where,

I - Index.

X_i - The normalized value of i^{th} indicator.

L_{ij} - Factor loading value of the i^{th} variable on the j^{th} factor

E_j is the Eigen Value of j^{th} factor

Based on the index so obtained, the MPCSS jurisdiction districts are assigned their ranks. The comparison of the index of a SHIMUL was done with a maximum value of 1 and a minimum value of 0. The indices were obtained using the above steps for each set of indicators, *viz.*, Milk procurement,

Membership, Vaccination service to the animal, Profit on milk sale, Loans to members, and Cattle feed variable, and their normalized values are themselves treated as indices.

1. PCA was performed for these six indices and every index was treated as a variable, and the overall Composite Performance Index (CPI) was obtained using the steps mentioned above.
2. Based on CPIs, the MPCSSs were ranked and the jurisdiction district by using the CPIs value of milk union of the particular district, the highest index getting rank one (Best performing SHIMUL district) and the lower index getting the last rank (Least performing SHIMUL district). This would help to identify the MPCSS and districts that need improvement.

RESULTS AND DISCUSSION

Classification of study area according to dairy performance indicators

In every city private vendors are present in milk marketing and the Shivamogga is not an exception. These private vendors, compete with the cooperatives. Hence, building a strong network with farmers is important to increase loyalty and favorable opinion. The critical variables like daily milk procurement, cattle feed distribution, vaccination service, members' loans, and extending milk profit were considered to develop a composite dairy performance index for each the study districts.

Performance indicator of MPCSS in the jurisdiction of SHIMUL

Appraisal of Table 1 on the performance of various MPCSS in the jurisdiction of the district concerning per society membership as the first indicator reveals that Anandpura MPCSS showed the highest score value of 0.82 followed by Balur and Sunadakoppa, Thimmappaiana Halli while Shyagle and Dharamapura exhibited the least score of 0.01. Thus results showed significant variation concerning enrollment of members among the selected MPCSS. Similarly with respect the cattle feed distribution to

Table 1: Performance indicator scores of selected MPCs of SHIMUL during the study period

Sl. No	District	MPCS Taluk	MPCS	Membership	Cattle feed Distribution	Vaccination	Profit on milk sale	Loans to members	Milk procurement
I	Shivamogga	Sagara	Balur	0.74	1.00	0.44	0.78	0.49	0.58
		Shikaripura	Sunadakoppa	0.70	0.68	0.44	1.00	0.35	0.58
		Shivamogga	Harnahalli	0.43	0.60	0.68	0.70	0.24	0.59
		Bhadravathi	Arebelachi	0.72	0.39	0.31	0.45	0.36	0.72
		Sagara	Anadapura	0.82	0.88	0.51	0.28	0.51	0.48
II	Davanagere	Davanagere	Dodabathi	0.40	0.40	0.66	0.62	0.45	0.87
		Honnali	Hale Joga	0.49	0.41	0.44	0.41	0.52	0.81
		Davanagere	Shyagale	0.01	0.12	0.44	0.02	0.65	0.48
		Harihar	Bevenahalli	0.63	0.40	0.20	0.46	0.45	0.85
		Honnali	Guddehalli	0.42	0.06	0.66	0.03	0.29	0.97
III	Chitradurga	Hosadurga	Aladahalli	0.49	0.60	0.51	0.62	0.36	0.72
		Hiriyur	Dharamapura	0.01	0.39	0.66	0.41	0.51	0.48
		Chitradurga	Jampanna Nayakana Kote	0.63	0.11	0.44	0.02	0.45	0.87
		Challakere	Thimmappaiana Halli	0.70	0.40	0.44	0.46	0.52	0.81
		Holalkere	Arabagatta	0.43	0.68	0.20	0.45	0.65	0.49

Table 2: Composite performance indices of selected MPCs of SHIMUL during the study period

Sl. No.	SHIMUL Jurisdiction District	Taluk	MPCS	Added Composite index value of all the indicators	Average Added Composite index value of all the indicators	Rank
I	Shivamogga	Sagara	Balur	4.03	3.354	I
		Shikaripur	Sunadakoppa	3.75		
		Shivamogga	Harnahalli	2.56		
		Bhadravathi	Arebelachi	2.95		
		Sagara	Anadapura	3.48		
II	Davanagere	Davanagere	Dodabathi	3.4	2.724	II
		Honnali	Hale Joga	3.08		
		Davanagere	Shyagale	1.72		
		Harihara	Bevenahalli	2.99		
		Honnali	Guddehalli	2.43		
III	Chitradurga	Hosadurga	Aladahalli	2.79	2.706	III
		Hiriyur	Dharamapura	2.46		
		Chitradurga	J. N. Kote	2.53		
		Challakere	Thimmappaiahna halli	3.33		
		Holalkere	Arabagatta	2.42		

members chosen as another performance indicator, Balur MPCs showed the highest score value of 1. At the same time, J N Kote had the most negligible score value (0.11). The third indicator was the vaccination

to dairy animals, which was another important activity undertaken by MPCs to promote dairying in the study area. This indicator was more evenly distributed across the MPCs as the lowest score was

0.31 recorded by Arebelachi MPCs and the highest value of 0.68 recorded by Harnahalli MPCs exhibited good performance concerning physical indicators.

On the other hand, concerning financial indicators like profit on milk sale, loans disbursed, and milk procurement, the MPCs of Sunadakoppa consistently showed the highest profit during the study period with a value of 1 (maximum possible), while Shyagale, J.N. Kote showed lowest index value (0.02). There was a vast difference in score value among the MPCs in the jurisdiction district. The loans provided to the members by MPCs showed wide variation in the quantum of loans advanced during the study period by each of the MPCs, the highest score value for loans was observed for Arabhagatta MPCs (0.65), and the least was observed for Harnahalli (0.24). The milk procurement by MPCs in the selected district directly contributed to profitability, indicating the popularity of MPCs among dairy farmers. The score ranged from 0.48 (Anandpura) to (0.97) Guddehalli.

Composite performance indices of MPCs in the jurisdiction of SHIMUL

As mentioned earlier in the methodology, the composite performance index was used to reveal the performance of MPCs in the jurisdiction of study district. The results presented in Table 2 reveals that the overall composite index for each MPCs was developed by considering six chosen variables like daily milk procurement, profitability, a number of members per society, the quantity of cattle feed distributed and loans advanced to the members. Across the study districts, the MPCs coming under the Shivamogga district showed a higher index value compared to MPCs in Davanagere district and the Chitradurga district. The Shivamogga, Davanagere, and Chitradurga districts were ranked I, II, and III based on the magnitude of indicator value (Average Added Composite index value of all the indicators). The Shivamogga district showed the highest (3.354) score, followed by the Davanagere district (2.72), and the Chitradurga district showed the lowest indices with a value of 2.70. Thus it can be concluded that the Shivamogga district was found to be the best performing district among all the districts based on the performance indices of MPCs in its area of operation. The best performance can be attributed to

the fact that Shivamogga is located in the malenadu region of Karnataka with higher and assured rainfall, and farmers grow commercial crops such as areca nut, black pepper, etc., and could possess better economic conditions. Hence, with the better income of the farmers, the performance of MPCs in Shivamogga district was better than in other districts. Therefore, with the higher income of the farmer in the Shivamogga district, they are in a better position to buy the feed concentrates and other services in the livestock rearing. They are mainly rearing exotic species of cattle, undertaking timely vaccination for the cow, and cultivating different fodder crops for milch animals, which helped them realize higher milk yield and achieved a higher standard of living for farmers. In other words, better economic conditions enabled them to adopt new crop production technology and reasonable clean milk production practices. They realize the benefits of new technology from the crop and the rearing of milch animals.

CONCLUSION

Results of the study revealed that MPCs of the Shivamogga district were working better than the MPCs of Davanagere and Chitradurga districts, hence the Union need to concentrate on MPCs in these districts and bring desirable changes to improve enhance the profit of the MPCs in turn for the Union.

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