



# Institutional Development and Efficiency of Fishermen Co-operatives in Marine Fisheries: A Case Study from Kerala

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## Abstract

Fishermen co-operatives have played a significant role in improving the livelihood of millions of fishermen. The extended co-operative services and efficiency of co-operatives over the years make the co-operatives effective. This paper presents the institutional development and efficiency of two fishermen co-operative societies *viz.*, Njarakkal (Society I) and Manassery (Society II) in Ernakulam district, Kerala. It was revealed that there were spatial and temporal differences in institutional development between two societies while delivering co-operative services. From the results of Data Envelopment Analysis (DEA), it was found that the mean technical efficiencies estimated using Variable Returns to Scale (VRS) were 96 and 87% in Society I in and Society II respectively. The scale efficiency revealed that the Society II is operating at sub-optimal scale size than Society I. The amount of loan disbursed and repayment, income from fish marketing services were the factors responsible for the efficiency of co-operatives.

**Keywords:** Fishermen co-operatives, institutional development, efficiency, data envelopment analysis

## Introduction

Fisheries co-operatives have been a means of addressing various grassroots level problems of

stakeholders. As an institution, they can be effective in improving the socio-economic status of fishers and help in bringing fisheries management initiatives and programs to the fishers (Barratt, 1989; Baticodas et al., 1998; Kherallah & Kirsten, 2002; Anderson & Henehan, 2003; Unal, 2006; Sinha, 2012). For the economic development of fishermen, various welfare schemes of Government are implemented through fishermen co-operative societies. While there are several instances where fisheries cooperatives have been successful, several others have also been functioning poorly (Kurien, 1988).

In Kerala, Matsyafed (Kerala State Co-operative Federation for Fisheries Development Ltd.) is the apex body and FDWCS (Fishermen Development Welfare Co-operative Societies) functions under it. Matsyafed is responsible for promoting various schemes of production, procurement, processing and marketing of fish and fish based products to the fishermen. The fisheries co-operatives are also fairly active in Kerala (Peediyakkan, 2013). Like other co-operatives, the fishermen co-operatives are also organized in a three-tier structure with primary co-operative societies at the village level, district level co-operatives or secondary co-operatives at district level and one apex state level co-operative federation. Spatial and temporal differences in institutional development (functioning) and efficiency (performance) of fishermen co-operative societies in terms of resource utilization and service delivery is reported. This study attempts a comparative assessment of institutional development, efficiency and indicators that explain the efficiency of fisheries co-operative societies by taking Ernakulam District as a case.

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**Materials and Methods**

Njarakkal - Nayarambalam Fishermen Development Welfare Co-operative Society (henceforth referred to as Society I) and Manassery Fishermen Welfare Development Co-operative Societies (henceforth referred to as Society II) in Ernakulam district, Kerala were randomly selected for the study. The data for the study were collected from both primary and secondary sources *viz.*, annual reports, ledger files and through focus group discussion. The data on number of members, share capital, auction value, input supply and schemes and bonus were collected from the registers of the co-operatives for the study. Time series data on loan disbursal, auction value and bonus were also collected for the period of 2003-2014.

The services of co-operatives were assessed using the institutional development i.e., based on the introduction of services/ activities and development over the years in the particular society. To assess the efficiency of co-operatives, Data Envelopment Analysis (DEA) was used. DEA is a non-parametric, multi-factor productivity method used for assessing the efficiency of a set of Decision Making Units (DMUs). In which, the DMUs of similar entities are compared against the 'best virtual decision making units. (Rutledge et al., 1995; Ariyaratne et al., 1997; Battacharya et al., 1997; Kumar & Gulati, 2008; Das & Gosh, 2009; Aisyah et al., 2012; Chandrasekar & Gopal, 2012; Chandrasekar & Gopal, 2015). The basic efficiency is the ratio of weighted sum of outputs to the weighted sum of inputs.

$$\text{Efficiency} = \frac{\text{Weighted sum of outputs}}{\text{Weighted sum of inputs}}$$

Assuming the number of DMUs as 'p', with 'j' inputs and 'k' outputs, the relative efficiency score of DMU can be obtained by solving the following model (Battacharya et al., 1997; Ariyaratne et al., 2000; Kumar & Gulati, 2008; Das & Gosh, 2009; Aisyah et al., 2012).

$$\begin{aligned} &\text{Maximise } \frac{\sum_{k=1}^s v_k y_{kp}}{\sum_{j=1}^m u_j x_{jp}} \\ &\text{Subject to } \frac{\sum_{k=1}^s v_k y_{kp}}{\sum_{j=1}^m u_j x_{jp}} \leq 1 \end{aligned}$$

$$v_k \geq 0,$$

$$u_j \geq 0,$$

Where,

$$K = 1 \text{ to } s,$$

$$J = 1 \text{ to } m,$$

$$I = 1 \text{ to } n,$$

$y_{ki}$  - Amount of output 'k' produced by DMUi

$x_{ji}$  - Amount of input 'j' utilized by DMUi

$v_k$  - Weight assigned to output k

$u_j$  - Weight assigned to input j

In the present study, six inputs and one output were used for the DEA analysis. Inputs used were the amount of loan disbursed ( $X_1$ ), amount of loan repayment ( $X_2$ ), returns from fish marketing ( $X_3$ ), amount of bonus distributed ( $X_4$ ), and returns from input supply ( $X_5$ ). The profit earned by the co-operative society (Y) was taken as output.

For better understanding, the efficiency of society I and society II was compared using variable returns to scale (VRS) alone, because in fisheries co-operatives, the output reflects increasing, constant and decreasing returns to scale instead of constant returns alone (Iliyasu et al., 2016). The CRS assumption is appropriate only when all the DMUs are operating at an optimal scale and exhibits only at constant returns to scale. The CRS method was explained by Charnes, Cooper and Rhodes (CCR) model (1978). While in other cases, VRS method is used by Banker, Charnes and Cooper (BCC) in 1984. For the purpose of scale efficiency, technical efficiencies at both VRS and CRS were used (Hassan et al., 2009).

$$\text{Scale efficiency (SE)} = \frac{TE_{crs}}{TE_{vrs}}$$

Where,

$TE_{crs}$  - Technical efficiency of CRS

$TE_{vrs}$  - Technical efficiency of VRS

The value of Scale Efficiency ranges between zero to one. If the value of SE is equal to 1, it means that DMU is scale efficient or otherwise. The multiple regression function was analysed to estimate the factors determining the efficiency of the selected co-operative societies (Crentsil & Ukpong, 2014; Fechete & Nedelcu, 2014). The relationship between

independent and dependent variables are specified as,

$$Y = f(x_1, x_2, x_3, x_4, x_5)$$

$$Y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_4x_4 + \beta_5x_5 + e$$

Where,

Y – Technical efficiency

$x_1$  – Amount of loan disbursed

$x_2$  – Amount of loan repayment

$x_3$  – Returns from marketing

$x_4$  – Amount of bonus distributed

$x_5$  – Returns from input supply

$\beta_0$  – Intercept

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$  – regression co-efficients

$e$  – error term

The indicators which could be used for assessing the efficiency of co-operatives societies were studied based on perception of members of the Societies using Likert scale. It was ranked based on acceptance level of members (Chibandal et al., 2009).

### Results and Discussion

Njrakkal - Nayarambalam Fishermen Development Welfare Co-operative Society (Society I) was established in 1988 and Manassery Fishermen Development Welfare Co-operative Society (Society II) was established in 1992. Both the Societies are affiliated

to Matsyafed. In 2014, there were 3446 and 2300 members in Society I and Society II respectively. Implementation of credit schemes was the main service of the society. The other services are related to marketing (fish auctioning), and commercial as well as welfare activities. However, the co-operative services have diversified over the time to meet the demands of members (fishers). During 1974, Fisheries was included as a component under National Co-operative Development Corporation (NCDC) and credit was given under Integrated Fisheries Development Project (IFDP) schemes. These schemes are implemented by Matsyafed, but the credit is disbursed through fishermen co-operatives.

In Society I, the major activity started with disbursement of ordinary, short term and other loans. Under the NCDC-IFDP scheme, during 2012, the Society financed 10 groups for procuring fishing inputs, in the form of assistance (Rs. 68.44 lakhs) and loan (Rs. 6.16 lakhs). The repayment under NCDC was between 75 to 80%. The society has been intervening in marketing of fish through Matsyafed since 1999 (Fig. 1.).

Later, educational and fish vending loan were developed. The input supply and fish auctioning activities were started after a decade of its inception. Auctioning of fish was streamlined to ensure that the middlemen are eliminated and to facilitate proper loan repayment by members. There were 19 groups with 925 members availing the services for

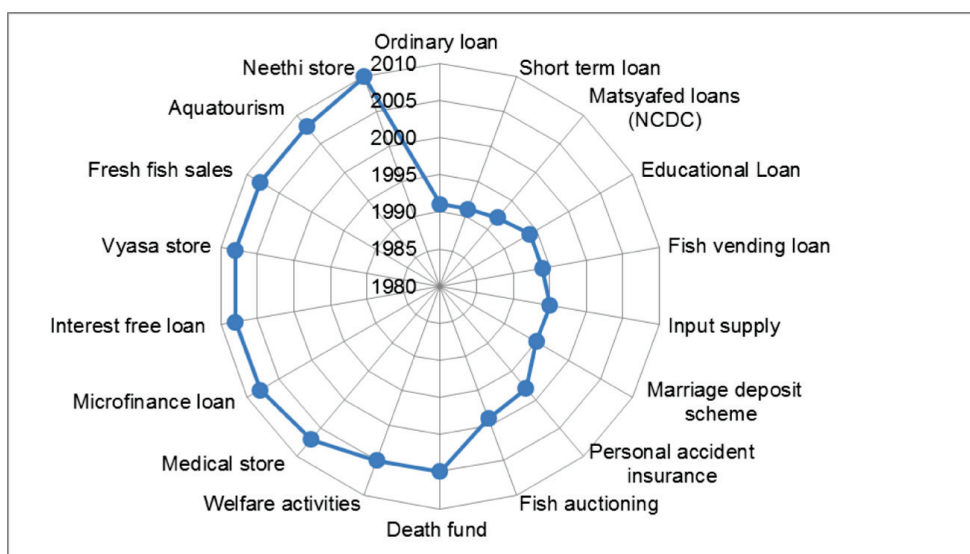


Fig. 1. Radar diagram showing development of Society I

fish auctioning through the Society during 2014. The microfinance loan, interest free loan, *Neethi* store (provision store) were the modern co-operative services.

The institutional development at Society II is presented in Fig. 2 which is almost similar to Society I, its functions. providing credit loans to their members. The input supply and fish auctioning were started in the consequent years. Like, Society I, the microfinance loan and store were the latest services of the co-operatives. The functioning of the co-operatives were modified and altered based on the members demand for various services. The services introduced were liable to change or it can be discontinued either temporary or permanently. The services that were discontinued by the Society II were death fund, *Vyasa* store (fisheries input supply store) and *Neethi* stores.

From the DEA analysis, it was observed that the technical efficiency (TE) of the co-operative societies in Ernakulam over the period of 2003 to 2014. Using VRS method varied from 0.885 (2003) to 1.000 (2014) indicating marginal increasing trend in their efficiency level at variable return to scale in Society I and for Society II, it ranged from 0.713 to 0.965 (2014) showed increasing trend.

A similar study carried out on co-operative banks by Bhatt & Bhat (2013) revealed that of the eight banks studied, three and five banks were efficient using CRS and VRS methods respectively. The mean technical efficiencies for the VRS DEA model were 96 and 87% in Society I and Society II respectively. The technical efficiencies of Society I was mainly attributed to the credit and fish auctioning services. During the period of study, from Society I, 4581 fishermen sold their fish through auctioning facilitated by the fishermen co-operatives and the auction value exceeded ₹ 6579 lakhs.

The scale efficiency of Society I and Society II help to identify the nature of inefficiencies. A value of SE '1' implied that the DMUs are operating at the Most Productive Scale Size (MPSS). From the study, it was observed that the SE was less than 1 for both the Societies indicating that during the period of study, the societies were not operating in their optimal scale size. However, the level of efficiency of Society I was comparatively more than Society II (Fig. 4).

For Society I, the TE was low (below 0.40) during three years viz., 2002, 2003 and 2004 and it was higher (above 0.80) during the years 2010, 2011 and 2012 and the rest six years it was medium (between 0.4 to 0.8). In Society II, six years had SE values

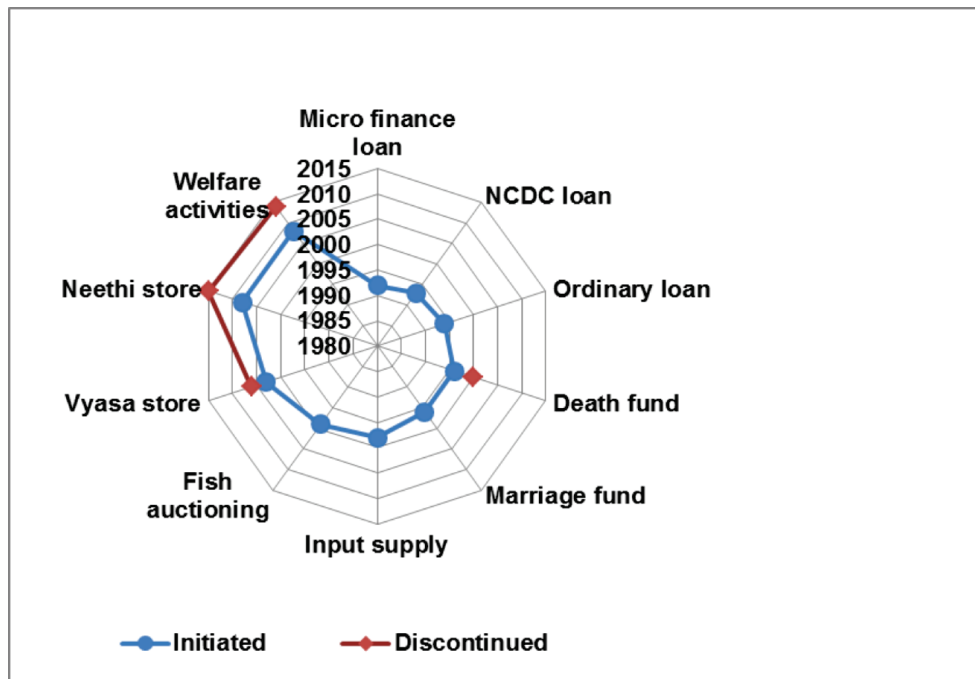


Fig. 2. Radar diagram showing development of Society II

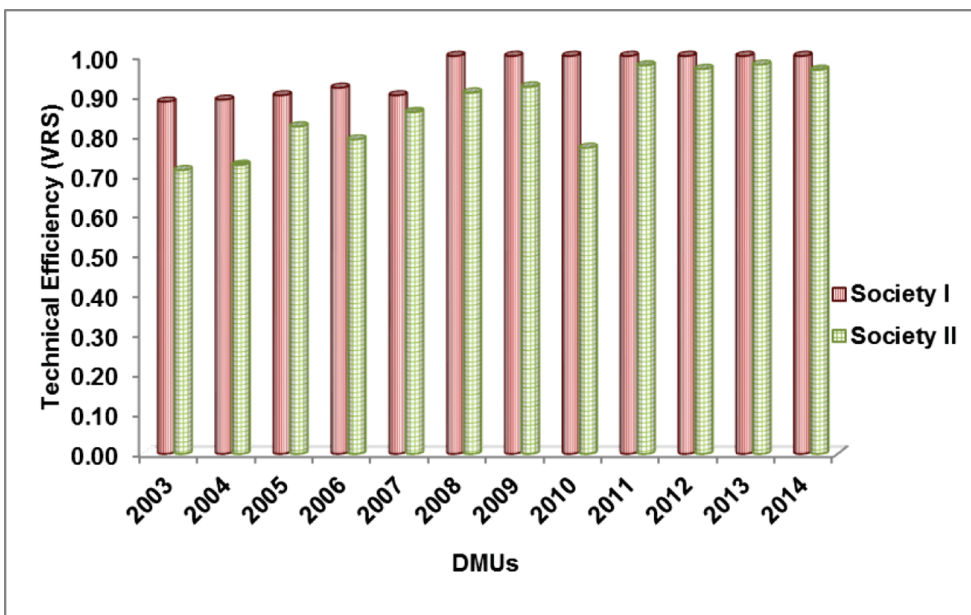


Fig. 3. Technical efficiency (VRS method) of selected Co-operative Societies

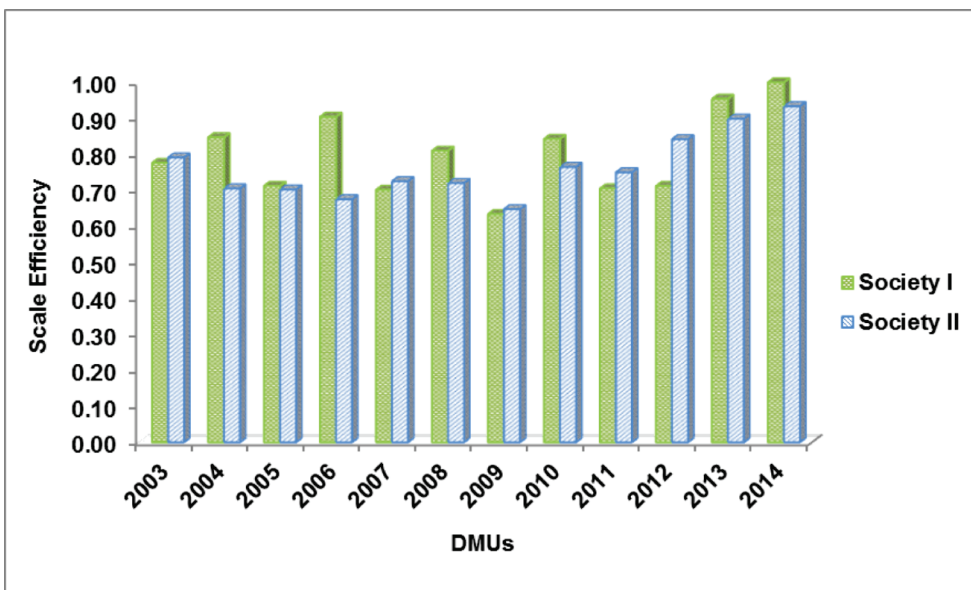


Fig. 4. Scale efficiency of selected Co-operative Societies

of 0.40 and rest in the efficiency level between 0.4 to 0.8 category. It was revealed that the Society I performed better than Society II in terms of input and service delivery. It was clear from the profit and repayment that the Society earned ₹ 16.75 lakhs as profit with more than 80% repayment recorded in Society I as compared to 68% in Society II. Kumar & Gulati (2008) studied the technical efficiency of public sector banks in India and found that the low

scale efficiencies are mainly attributed to the low repayment or non-repayment of loans by the members and also managerial inefficiency.

The mean scale efficiency was 0.89 and 0.80 in Society I and Society II, respectively. It was revealed that the constraints in finance were the major reason for the low efficiency in Society II. This can be improved by streamlining the mechanism for the

Table 1. Indicators for assessing the performance of fishermen co-operative Societies

| S. No. | Indicators                             | Society I |      | Society II |      |
|--------|--|-----------|------|------------|------|
|        |  | % score   | Rank | % score    | Rank |
| 1      | Legal status                           | 100.00    | 1    | 90.00      | 1    |
| 2      | Co-operative planning & administration | 68.59     | 4    | 80.00      | 3    |
| 3      | Human resource management              | 60.48     | 6    | 50.00      | 7    |
| 4      | Financial management                   | 85.25     | 2    | 88.89      | 2    |
| 5      | Services delivery                      | 70.00     | 3    | 57.14      | 6    |
| 6      | Market linkages                        | 65.26     | 5    | 60.67      | 5    |
| 7      | Membership strategies                  | 45.68     | 7    | 70.00      | 4    |

loan disbursal such as timely disbursal of credit and ensuring full repayment.

Society I:

$$Y = 1.72 + 0.67 x_1^* - 0.23 x_2^* + 0.25 x_3^* + 0.04 x_4 + 0.003 x_5$$

$$R^2 = 0.77; F - \text{stat} = 24.52^{**}$$

Society II:

$$Y = -1.23 + 0.55 x_1^{**} - 0.12 x_2^* - 0.20 x_3^* + 0.01 x_4 + 0.002 x_5$$

$$R^2 = 0.54; F - \text{stat} = 18.52^*$$

\* indicates the significance at 5% probability level

\*\* indicates the significance at 1% probability level

The factors influencing the technical efficiency were the amount of loan disbursed and repayment and income from fish marketing were the variable explained the efficiency in Society I. For Society II, amount of loan disbursed was the significant factor.

Indicators used for assessing the efficiency of co-operative societies are given in Table 1.

It was revealed that the legal status, financial management, co-operative planning and administrative procedures, membership strategies and market linkages were the five major indicators which can be used to assess the efficiency of co-operatives (Nkuranga, 2013). The other indicators were services to members and human resource management. These indicators can be taken as standard indicators for assessing the efficiency of any institutions. Based on the relative importance and level of acceptance, it was found that the co-operatives production and training to members were not contributing for the co-operatives efficiency of both the societies.

The study concluded that fishermen co-operatives play a significant role in improving the livelihood of fishermen and the major activities of the Society. The institutional development in the Society was in tune with the social and development schemes of the region and the Society has been an implementing agency. The mean technical efficiencies estimated the VRS DEA model were 96 and 87% for using Society I and Society II, respectively. The significant factors influencing the efficiency of co-operatives were the amount of loan disbursed, amount of loan repayment and returns from fish marketing services. Legal status, financial management and co-operative and administrative planning are the indicators identified for assessing the efficiency of co-operatives. It has been observed that lack of complete repayment of loans by the members are the major constraints. There is a need to expand the co-operative services by providing technical support on advanced fishing technologies to stakeholders and effective fisheries management. Improving the efficiency of co-operative societies through proper monitoring and repayment mechanisms also needs to be strengthened.

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