Report on Sustainability of Dairy Cooperative Societies Organized under National Dairy Plan I

Submitted to

National Dairy Development Board (NDDB)

April 2019

Institute of Rural Management Anand

Anand, Gujarat-388001

RESEARCH TEAM

PRINCIPAL INVESTIGATORS

Dr. Rakesh Arrawatia

Dr. Shyam Singh

Dr. Vivek Pandey

RESEARCH ASSOCIATE

Mr. Deepak Kumar

Executive Summary

➢ The National Dairy Plan Phase I (NDP-I) has been implemented in 18 major Indian states with a share of about 90 percent of the total milk production in the country. NDP-I aims to increase milk productivity and improve access of milk producers to the organized milk processing sector. Under NDP I, as part of its Village based milk procurement systems (VBMPS), more than 9,000 new Dairy Cooperative Societies (DCSs) have either been organized, revived or strengthened. Therefore, DCSs have become an important vehicle to implement NDP-I. This study has thus been carried out to analyze the sustainability prospects of newly formed DCSs under NDP-I.

➢ The study designs a framework to evaluate the performance of the DCS on the basis of inputs like DCS Ability, Physical-Technical support, Governance and management, allied support and common support and outputs like milk intensity and membership intensity. The DCS were ranked based on the efficiency scores which were estimated on the basis of the Data Envelopment Analysis framework. Analytical Hierarchical Process was also applied to create the indices for the study.

➢ Data has been collected from 100 randomly selected DCS from six states: Karnataka, Bihar, Madhya Pradesh, Punjab, Maharashtra, and Tamil Nadu. A DCS level survey questionnaire was designed and implemented to collect primary data. A total of 20 case studies have also been carried out.

- On the basis of analysis using DEA and AHP, the study provided a composite list divided into three regions: high, medium and low performing DCS. A total of 17 DCS are ranked high, 41 DCS are ranked medium, and 40 DCS are ranked low.

- Welfare analysis was also carried out to see the benefits received by the households associated with the NDP I. It is anticipated that DCS membership is akin to market connectedness. It introduces the discipline of market in dairy activities for households and enhances their competence to take welfare enhancing decisions. This study also seeks to estimate the welfare impacts of NDP-I on DCS households. The study suggests that the connection with the dairy cooperative societies has helped DCS households in increasing their dairy income significantly.

- Successful DCS have been able to mobilize assets and maintain milk procurement. Governing body is quite active in these DCS. These DCS have been maintaining proper financial records and carried out audits regularly.

- The study team conducted case-studies to see the reasons for success and failure of these DCS. The case study analysis revealed that the DCSs have to prioritize and adhere to certain aspects in short term whereas other aspects could be addressed in a long term.

- There is a scope to expand the membership base. DCS can devise focused strategies to increase the membership case. Immediate attention can be given to non-members who pour milk to DCS. They can be made shareholders of the DCS.

- DCS must acquire basic assets to operate effectively. There is need to adopt technological innovations (such as automatic fat testing machine, etc.). This will increase the trust among the members of the DCS.

- The governance structure of the DCS is carrying out basic minimum functions that are necessary to run the operations of the DCS. However, in order to progress further, governance structure needs to go beyond basic minimum functions and act progressively.

- Long terms attention must be provided to effective governance practices and enhanced role of the DCS in non-dairy social and cultural matters, which would in turn provide validity to the DCS in the society.

- Greater and consistent volume of milk procurement and higher number of membership are certainly major outcomes, however increased role of the DCS in community life and its relevance as a social institution would provide it longevity, hence a sustainable future.

Table of Contents

List of Tables

List of Figures

	Abbreviations
AHP	Analytical & Hierarchical Processes
AI	Artificial Insemination
AMCU	Automatic Milk Collection Unit
BMC	Bulk Milk Coolers
COMFED	Bihar Milk Co-operative Federation Ltd.
DCS	Dairy Cooperative Society/s
DEA	Data Envelopment Technique
DEDS	Dairy Entrepreneurship Development Scheme
DMU	Decision Making Units
DPMCU	Data Processing Milk Collection Unit
EIA	End Implementing Agencies
HGM	High Genetic Merit Bulls
HH	Households
LRP	Local Resource Persons

MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act 2005
NDDB	National Dairy Development Board
NDP 1	National Dairy Plan 1
NPDD	National Program for Dairy Development
PMU	Project Management Unit
PS	Pedigree Selection
PT	Progeny Testing
QCA	Qualitative Comparative Analysis
RBP	Ration Balancing Program
SNF	Solids Not Fat
VBMPS	Village Based Milk Procurement System

1. Introduction

India is predominately an agricultural nation with 3 percent annual growth in agriculture sector as per World Bank report 2017-18. Dairy sector has been growing at an annual rate of 6.65 percent as per the Department of Animal Husbandry and Dairying 2017-18, Government of India. In 2017-18, India produced 176.4 Million tonnes of milk with a per capita availability of 374 Grams (NDDB, 2018). As per NDDB report, 34% of the total milk produced is sold to unorganized sector, while the organized sector accounts for only 20% of the total milk produced. The remaining 46% of milk is consumed locally. In organized sector, cooperatives and producer companies are the major players, where the cooperatives dominate with 80% share in the total revenue (NDDB, 2017). There are total 22 state level milk federations in the country under which district level milk unions cover around 177,000 village dairy cooperative societies (DCS) with memberships of 16.3 million milk producers (NDDB, 2017). The development of cooperatives in India is not identical across the country; the cooperative structures are comparatively stronger in Northern and Western parts as compared to Southern and Eastern parts of India.

Dairying has become an important secondary source of income for millions of rural families and has assumed the most important role in providing employment and income generation opportunities particularly for marginal and women farmers. The government of India is making efforts towards strengthening the infrastructure for production of quality milk and also the procurement, processing and marketing of milk and milk products through the following Dairy Development Schemes in the recent times:

- National Programme for Dairy Development(NPDD)
- National Dairy Plan (Phase-I)
- Dairy Entrepreneurship Development Scheme(DEDS)
- Support to Dairy Cooperatives
- Dairy Processing and Infrastructure Development Fund (DIDF)

1.1 About National Dairy Plan Phase I

National Dairy Plan Phase I (NDP- I), a central scheme, was launched in 2011-12 with the aim of increasing milk productivity of milch animals to support the rapidly growing demand for milk by strengthening and expanding the infrastructure and disseminating new technology among dairy farmers. Although, India is the largest milk producing country in the world, still our milk productivity is way lesser than the world's average. This program targets rural dairy farmers to provide or to connect with formal and stable milk market.

NDP-I focuses mainly on 18 major milk-producing states, namely, Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal, Telangana, Uttarakhand, Jharkhand and Chhattisgarh which collectively account for more than 90 percent of the milk production in India. These states also account for 87 percent of breedable cattle population and 98 percent of fodder resources (NDDB. Co-op, 2018).

The National Dairy Plan phase I (NDP I) intends to support the following three components:

I. Productivity Enhancement:

This component aims to increase the productivity of bovine through better breeding and nutrition services. To achieve higher productivity, the program needs to support the following activities:

Sub-component - 1: Animal Breed Improvement

- Production of high genetic merit bulls (HGM) through progeny testing (PT) program, Pedigree selection (PS) program and to import exotic bulls/embryos/frozen semen.
- Strengthening of existing semen production stations and establishment of new semen stations.
- Delivery of Artificial Insemination (AI) services through trained mobile AI technicians.

Sub-component – 2: Animal Nutrition

- Extension service – Ration Balancing Program (RBP) – would be provided through trained local resource persons (LRP) for advising on animal feed and nutrition.

- Extension service for fodder development – improved fodder seed production, silage making, fodder contracting, and reducing wastage of dry fodder through processing and enrichment.

II.   Milk Collection and Bulking:

This component aims at improving access to market and enhancing infrastructure and bulking facilities through various interventions including:

- Expansion of existing and establishment of new Dairy cooperative societies.
- Providing training to and capacity building of milk producers and functionaries.
- Promotion of new milk producer companies.
- Enhancing and creating village level infrastructure for milk collection and bulking such as milk cans, bulk milk coolers, weighing and testing equipment etc.

III.   Project Management and Learning:

This component aims to improve coordination and smooth implementation of project activities which is achieved through regular and timely monitoring of the progress made and the outputs achieved, and learning through feedback to management. To achieve these outcomes following activities were put into practice:

- Support for Project Management Unit (PMU)
- Technical assistance in program implementation
- Quality assurance/auditing from the third party
- Program evaluation at the different stage through external agencies
- Creating data management system at PMU and involving the End Implementing Agencies (EIA) in collecting data for the different components of the program.

The program was implemented by National Dairy Development Board (NDDB) with the help of End Implementing Agencies (EIA) such as the milk union. The primary responsibility of EIA's was to provide support to dairy cooperative society through which, it transfers to dairy farmers to improve productivity. In this whole process, Dairy cooperative society works as an aggregator of

milk and acts as a channel between the dairy farmers and various supporting organizations such as NDDB, state government, central government etc. Also, due to the structural value of these cooperatives, various other non-dairy benefits and programs are also delivered and implemented through it.

The success of NDP I can be seen from the growth in milk production through the duration of this program. Initially, in 2011-12, the milk production stood at 127.9 million tones with per capita availability at 290 grams per day. Whereas, in 2017-18, milk production went upto 176.4 million tones with per capita availability at 374 grams per day (NDDB.Co-op, 2018). The annual milk growth achieved during the program years was more than 8 million tons per year which is substantially higher than 3 million tons per year from 1990 to 2012.

1.2 Broad Objective of study:

The National Dairy Plan Phase I (NDP-I) has been implemented in 18 major Indian states and aims to increase milk productivity and improve access of milk producers to the organized milk processing sector. Under NDP I, as part of its Village based milk procurement systems (VBMPS), more than 9,000 new Dairy Cooperative Societies (DCSs) have either been organized, revived and strengthened thus making the DCSs a significant medium to implement NDP-I. To analyze the sustainability prospects of the newly formed DCSs under NDP-I a study was carried out which attempted to document the reasons for success, failure and variations in the levels of performance of the DCSs under NDP I.

Studies have been conducted to evaluate performance of cooperative societies. There has been growing evidence of economic viability of farmer cooperatives in the developing world (International Cooperative Alliance 2017). Governance characteristics have mixed effect on performance in framer cooperatives in Greece (Benos *et al*, 2016). Sidhu & Sidhu (1990) understood performance of milk cooperatives in Punjab on parameters like growth rate and stability of membership. They took the indicators such as average lending of the member, pattern of over dues, capital formation, the business expansion patterns & the measures of income, expenditure & profits, etc. Capital formation and member borrowings in these cooperatives were also studied. However, the current study would be unique as instead of looking at district milk unions, this study to try to gauge the performance of village level dairy cooperative societies so as to understand their sustainability.

This study basically sought to assess the sustainability of newly formed DCSs under NDP-I. The objectives of this study were as follows:

1. To develop physical, financial, membership and governance parameters for a sustainable dairy cooperative society.

2. Using the above parameters, access the physical and financial status of the new/revived DCSs organized under NDP I with: a) a view of their long term sustainability, and b) categorization into low, medium and high performing DCS.

3. To assess and document the reasons for a) success and failure, and b) variation in the levels of performance of new and revived DCS in terms of support under NDP I and concerned EIA.

4. Welfare analysis of the impact of VBMPS sub-project on financial and sustainable livelihood outcomes for DCS members.

2. Methodology

The study is based on three different approaches through inter-connected methodological approaches. First, the parameters for measuring sustainability of the DCSs associated with physical, financial, governance and membership indicators were determined. Using these parameters, study categorized the DCSs into low, medium and high performers. Performance evaluation of DCSs based on these parameters was conducted using the non-parametric technique called Data Envelopment technique (DEA) along with Analytical Hierarchical Process (AHP). The study applied a combined DEA-AHP framework. A separate survey questionnaire was developed to analyze the defunct DCS as well.

Second, a welfare analysis was carried out at the household level. This analysis provided an estimate of the change in bargaining power of vulnerable groups due to functioning of DCS at the village level. A field experiment has been carried out to gauge the extent of improvement in bargaining power.

Third, 20 case studies were carried out in order to understand the sustainability aspects. In-depth case analysis enabled the team to understand necessary conditions to make DCS sustainable and also the circumstances and reasons that created hurdles for the DCS. A case study protocol was developed to conduct the case studies. Depending upon type and quality of data, qualitative comparative analysis is to be carried out to understand the efficacy of several causal conditions that make a DCS sustainable.

2.1 Analytical Hierarchy Process

AHP is used as a process to break down complex problems into a hierarchy, from the overall goal - which in our case is milk procurement level and membership growth – to various criteria on which the overall goal is dependent then, further descend to sub-criteria which affects the criteria and so on till the lowest level.

AHP modeling involves five steps:

1. The first step is to identify the overall goal, criteria and sub-criteria to form a hierarchy.
2. Constructing a questionnaire for creating pair wise comparison matrix.
3. Construction of standardized matrix.
4. Computing the vector of criteria weights.

5. Checking the consistency.

Analytical hierarchical processing technique is applied to find the weighted indices which act as input in the DEA technique. The five input indices are: Physical-Technical Support received from milk union, DCS Ability (measures support from DCS to members), Governance and Management of DCS, allied or other support, and Common support. The output variables in the study are average milk collected per member which acts as milk output intensity variable and average members per household in the village which acts as membership intensity variable. We would have ideally preferred to take milk growth and membership growth as output variables but due to different maturity levels and stage of development, these variables were showing very high variability and hence would not give stable results.

2.2 Data Envelopment Analysis

The study required evaluation of performance of DCSs on sustainability performance parameters associated with financial, economic, governance and membership indicators. Performance evaluation of DCSs based on these parameters was conducted using the non-parametric technique called- Data Envelopment technique (DEA). Apart from the DEA techniques, performance was also be evaluated by looking at other important parameters such as achievement of targets, implementation of sub-projects, *etc.* This study tried to look at performance using Radio Frequency Matrix technique to select DCS given the constraint of availability of data.

DEA as a measure of sustainability performance will indicated whether a DCS has been able to minimize its use of inputs in order to produce a given quantity of output or maximize the output quantity, given the quantity of input Charnes et al. (1978). This measure is in contrast with the parametric measures of performance which assumes a certain functional form and requires statistical distributions of various parameters of measurement.

DEA technique also provided measures of relative performance of evaluation units, in this case individual DCSs. The study ToR entailed comparison of planned outcomes with the actuals. Therefore, it was critical to benchmark performance by creating an ideal DCS. In addition to

providing benchmarks, DEA was used to analyze the magnitude and sources of inefficiencies as compared to the ideal DCS.

The functioning of DEA can be understood by assuming that there are five decision making units (DMU), which in our case will be five DCSs. The production process in each DCS will combine a set of inputs to produce output(s). Each DMU has a different level of input and output combination. In case of DCS, let us assume that there are two inputs, Physical Assets Index (K) and Governance Index (L) and the output is Growth in milk procurement (Y). We can develop index of the inputs, i.e, physical assets and governance. DEA enables us to identify the most efficient DMU and point out inefficiencies in other DMUs. Those units which provide maximum output using lower inputs or a given level of output using the least inputs will be the most efficient. This is illustrated below:

In our case, let the five DCS be D_1, D_2, D_3, D_4 and D_5 as given in figure 2.1 below. Suppose, they use two inputs: K and L and one output: Y, as explained in the paragraph above. The various combinations of ratios of inputs to outputs can be described graphically as given in figure 2.1 below:
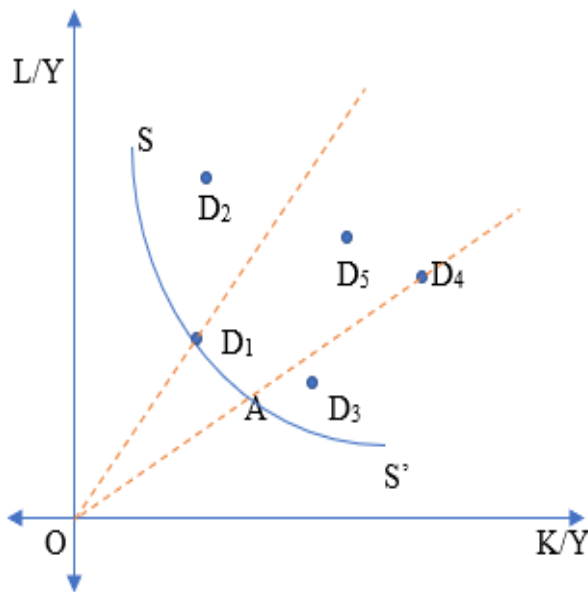
The Y-axis represents the ratio of labor to profit (L/Y) and the X-axis represents the ratio of capital to profit (K/Y).

D_1 is the point which has the minimum distance from the origin (O). Hence, it is the most efficient DMU. In other words, it has the most efficient input-output combination. Curve SS' shows the combinations of most efficient DMUs. That is, any DMU lying on the curve SS' will have the most efficient input-output combination.

Fig 2. 1:DEA Model Graphical Representation

The most inefficient DMUs will be those having the maximum distance from the origin (O). We can measure the technical efficiency of D_4. The line passing through the origin and point D_4 interacts the curve SS' at point A.

Technical Efficiency of $D_4 = \frac{OA}{AD_4}$

Thus, by identifying the inefficient units and benchmarking them against the most efficient unit, we can find out ways in which efficiency of these units can be improved by optimizing the input-output ratio.

When the number of inputs and outputs are large, the computations become difficult and the technique to solve complex systems is termed as CCR model which is an input oriented model. The mathematical representation of DEA is given below:

$$min\ \theta_i$$
$$s.t. \sum_{r=1}^{n} y_{mr}^t \gamma_r^t \geq y_{mi}^t$$
$$\sum_{r=1}^{n} x_{kr}^t \gamma_r^t \leq \theta_i x_{ki}^t$$
$$\gamma_r^t \geq 0$$
$$\sum_{r=1}^{n} \gamma = 1$$

Where N is number of DMUs, each producing m outputs using n inputs. DMU t uses input vectors given as:
$$x^t = (x_{it}, x_{2t}, ..., x_{nt})$$
DMUs produce output vectors:
$$y^t = (y_{1t}, y_{2t} ..., y_{mt}).$$

θ_i is the scalar efficiency score for the i-th unit. If $\theta_i=1$, the DMU is efficient as it lies on the frontier. If $\theta_i<1$, the DMU is inefficient and requires $(1-\theta_i)$ levels of reduction in inputs to reach the efficient levels. The system of equations can be solved using linear programming techniques.

The findings of DEA were substantiated and validated by documenting case studies at the DCS level. A case study protocol was developed to capture the relevant data and information.

Qualitative Comparative Analysis (QCA) method was applied to understand as to why certain DCS have or have not been able to perform successfully. This method identifies the causal conditions that can be created/provided in order to achieve sustainable performance related outcomes.

2.3 Parameters:

A discussed earlier the sustainability parameters were used as inputs for the purpose of this study. The performance of the DCS was analyzed by looking at these parameters as input to the DCS with the output being the membership and milk procurement growth.

2.3.1 Physical and Technical Support Index:

Creation of physical assets like BMC (Bulk Milk Cooler), AMCU (Automatic Milk Collection Unit), *etc.* can contribute in enhancing milk procurement. BMC gives flexibility to DCS as well as to pourers in collection of milk during the day. AMCU can help the DCS in maintaining transparency in payment to the members. Members receive a slip mentioning weight and quality of milk, this helps in gaining the trust of pouring and non-pouring members. AMCU aids in linking the quality of milk with remuneration. Hence, both quality and quantity can increase simultaneously at the DCS due to these physical supports.

Our study required the evaluation of performance of DCSs in terms of growth in milk procurement and member's growth using DEA technique. DEA technique provided measures of relative performance of every unit (DCS). EIA provided help to DCS in creating infrastructure for milk collection and bulking such BMC, AMCU, and other physical supports. DCS also received other allied support from the EIAs and various agencies like the government, NGOs, *etc*. Apart from the support provided by EIAs under NDP-I, there were other parameters which made a difference in their performance; these parameters are discussed below:

2.3.2 Governance and Management Index:

An efficient and well managed DCS will attract members who would want long term associations. DCS with better governance and management can perform better than others. This

will create confidence among members and also new members will be attracted leading to better performance in terms of growth in milk procurement of a particular DCS. A better governed DCS will distribute profits amongst its members in more equitable basis which will not only attract new members but will also act as an incentive for current members to increase the quantity and quality of their input

2.3.3 Allied Support:

This support to DCS comes mainly from milk union and state government. Milk union often arranges trainings and educative programs for the managing committee members, staff and member of DCS. Union makes payment to cooperatives as dividend on their shares and bonus is distributed depending on the quantity of milk supplied by the DCS in a particular year. Union also provides support to DCS for enhancing women involvement in dairy cooperatives. Continuous and concurrent audit by the union help cooperatives to keep on track. Besides above support from milk union, DCS also get benefits from state government through allied programs run by the state government.

2.3.4 DCS Ability Index:

DCS collects/buys surplus milk from pourer/members daily and ensures regular and remunerative payment. Also, members of DCS receive profit on equitable basis. These are the regular benefits which pourers get from DCS. Other supports and benefits provided by DCS to its members are training and education, low interest loans for expansion, and also community support through other members in cooperatives.

2.3.5 Common Support Index:

The village-based community system provides support for a DCS to sustain and flourish. This parameter captures this through various indicators and acts as an input for a DCS to perform well. These are the other qualitative parameters which are involved in determining the performance of DCSs. With the help of data collected for above parameters, it is converted into indexes, to reveal particular parameter(s) which may be challenging the performance of a particular DCS.

In our study, we analyzed the performance of DCS by evaluating membership intensity and milk procurement intensity as outputs. Every DCS which falls under NDP I are provided with the support (INPUTS) such as BMC, AMCU & other physical support to increase their Output. This support is common to all the DCS and may bring in differences in the performance of DCS, thus promoting sustainability of DCS. However, the major differences in performance can come because of other supports such as governance & management, DCS support to members, allied support, and community support. We created an index of the input parameters discussed in figure 2.2. By analyzing the performance from the above given parameters, we gauged the sustainability of DCS. This performance evaluation will help us to benchmark and rank the DCS on the basis of performance at state and national level considering the period of support. With the help of performance evaluation of sustainability parameters, the qualitative analysis and welfare analysis; a conclusion on the Sustainability of DCS was drawn. Figure 2.2 explains the support structure of the DCS.
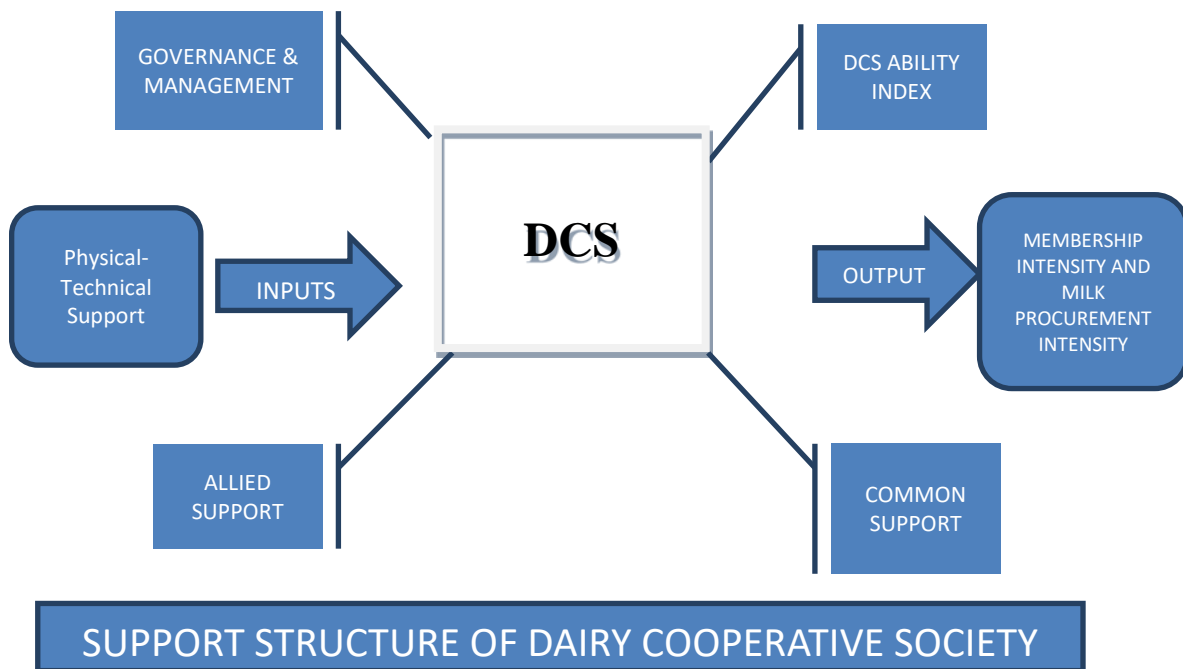
Fig 2.2: **Support Structure of the DCS**

2.4 Welfare Analysis

The study carried out a welfare analysis at the household level. This analysis enabled the estimation of change in bargaining power of vulnerable groups as a result of the functioning of DCS at the village level. A field experiment was carried out to gauge the extent of improvement in bargaining power.

2.5 Case Study

The study has carried out 20 case studies in order to understand the sustainability aspects. These cases include better ranked DCSs, low ranked DCSs and also a few cases of defunct DCSs. In-depth cross-case analysis provides insights into understanding the necessary conditions to make a DCS sustainable and also the conditions and reasons that have created hurdles for the DCS. A case study protocol was applied to conduct the case studies. A cross-case analysis was carried out to identify critical factors that explain the success and/or failure of a particular DCS.

2.6 Sampling

The sampling strategy adopted for this study tried to replicate as closely as possible the NDP-I roll-out plan. The study adopted a two-stage matching method. In the first stage we matched blocks and in the second stage we matched villages located inside the matched blocks. Matching was carried out using Census 2011 data. We created cohorts using phased roll-out of the VBMPS component of the NDP-I interventions. Villages that received the VBMPS during 2012-14 are considered as phase 1 villages and the villages that received VBMPS post-2014 have been identified as phase 2 villages. The same criterion was used to categorize blocks as well. The selection model that was used for matching blocks and villages contained variables measuring population, employment status, and caste.

The blocks and villages were matched by estimating the propensity of receiving the program in phase1. The selection model that was used for matching blocks and villages contained variables measuring population, employment status, and caste. The results from selection models are presented in the table 2.1 and 2.2.

Table 2. 1: Block Selection Model

VARIABLES	Probability (VBMPS in Phase1)
Number of HHs	.0011858

	(.0010852)
Population	.0040593**
	(.0018036)
Female population	-.0052253**
	(.0022852)
Age 0-6 years	-.0027963
	(.001829)
SC Population	-.0007071***
	(.00022)
ST Population	-.000025
	(.00028)
Female education	-.000226
	(.00085)
Cultivators	-.000114
	(.00073)
Agricultural labor	-.00103
	(.000671)
Household industry workers	-.004431
	(.0034)
Marginal workers	-.00129**
	(.00064)
Non-workers	-.00118*
	(.00069)
Constant	-.3052
	(.229)
Observations	366

Based on block selection model following blocks were identified for the DCS survey from phase1 and phase2.

Phase 1	
State	Block Name
Bihar	Rajoun
Bihar	Shahkund
Bihar	Bahadurpur
Bihar	Dhoraiya
Bihar	Biraul
Bihar	Shanbhuganj
Karnataka	Piriyapatna
Karnataka	Haliyal
MP	Babai
Maharashtra	Jamner
Maharashtra	Gangapur

Punjab	Anandpur Sahib
Phase 2	
State	Block Name
Bihar	Khagaria
Bihar	Teghra
Bihar	Rampur
Bihar	Nowkotti
Karnataka	Chamarajanagar
MP	Gadhpura
MP	Ghatiya
MP	Mahidpur
Punjab	Rajpura
Tamil Nadu	Krishnarayapuram
Tamil Nadu	Anai

Table 2. 2: *Village Selection Model*

VARIABLES	Probability (VBMPS in Phase1)
Number of HHs	-0.0114
	(0.0169)
Population	-0.0116
	(0.0120)
Female population	0.00841
	(0.0171)
Age 0-6 years	0.0179*
	(0.0104)
SC Population	-0.00320
	(0.00210)
ST Population	0.00332
	(0.0972)
Female education	0.0101
	(0.00689)
Cultivators	0.00583
	(0.00752)
Agricultural labor	0.00501
	(0.00769)
Household industry workers	-0.0206
	(0.0450)
Marginal workers	0.00382
	(0.00787)
Non-workers	0.00624
	(0.00952)
Constant	1.125**

	(0.539)
Observations	123

The village matching stage allowed us to identify a list of 100 matched villages and approximately 20 back-up villages to cover for contingencies. The list of matched villages has been provided in the annexure.

Using above strategy, 100 matched villages and approximately 20 back-up villages to cover for contingencies were identified. These villages are spread across six states and 19 districts (see Table 2.3). The list of matched villages has been provided in the annexure. The selection procedure led to a higher selection of villages from Bihar.

Table 2. 3: State-wise Sample Distribution

Selected States	No. of DCSs	No. of Districts
Maharashtra	6	2
Madhya Pradesh	13	2
Punjab	15	5
Karnataka	21	3
Tamil Nadu	3	2
Bihar	42	5

3. Sustainability and Performance Analysis

The study applies DEA-AHP model to evaluate the DCS for sustainability. We evaluated the performance of the DCS by applying the DEA-AHP framework and the better performing DCS has higher probability of sustaining in the longer run. The DEA-AHP technique rationalizes the performance so as to look at the output per unit of weighted inputs applied by the DCS. Thus, a DCS at an early stage would utilize lower inputs but at the same time they are able to give better outputs, they have a higher chance of sustaining.

Analytical hierarchical processing technique was applied to find the weighted indices which act as input in the DEA technique. The five input indices were: Physical-Technical Support received from milk union, DCS Ability (measures support from DCS to members), Governance and Management of DCS, allied or other support, and Common support. The output variables in the study were average milk collected per member which acts as milk output intensity variable and average members per household in the village which acts as membership intensity variable. We would have ideally preferred to take milk growth and membership growth as output variables but due to different maturity levels and stage of development, these variables were showing very high variability and hence would not give stable results.

3.1 Analytical Hierarchy Process

AHP is used as a process to break down complex problems into a hierarchy, from the overall goal - which in our case was milk procurement level and membership growth – to various criteria on which the overall goal is dependent; then further descend to sub-criteria which affects the criteria and so on till the lowest level.

AHP modeling involves five steps:

1. The first step is to identify the overall goal, criteria and sub-criteria to form a hierarchy.
2. Constructing a questionnaire for creating pair wise comparison matrix.
3. Construction of standardized matrix.
4. Computing the vector of criteria weights.
5. Checking the consistency.

3.1.1 Overall goal, criteria, and sub-criteria:

The goal of our study was to construct a composite index that can be used to evaluate the performance or efficiency of a particular DCS using definite criteria indices calculated using various sub-criteria. The criterions and sub-criterions were selected on the basis of extensive research on the industry and through the interviews of various stakeholders associated with the DCS. Only those sub-criterion or indicators were taken for the construction of indices on which data was available. Some sub-criterions had to be dropped due to unavailability of data at targeted samples.

The efficiency was calculated over five different criterions, viz., Physical-Technical Support received from milk union, DCS Ability (measures support from DCS to members), Governance and Management of DCS, allied or other support, and Common support. Hierarchal structure of AHP model is specified in the given figure 3.1.
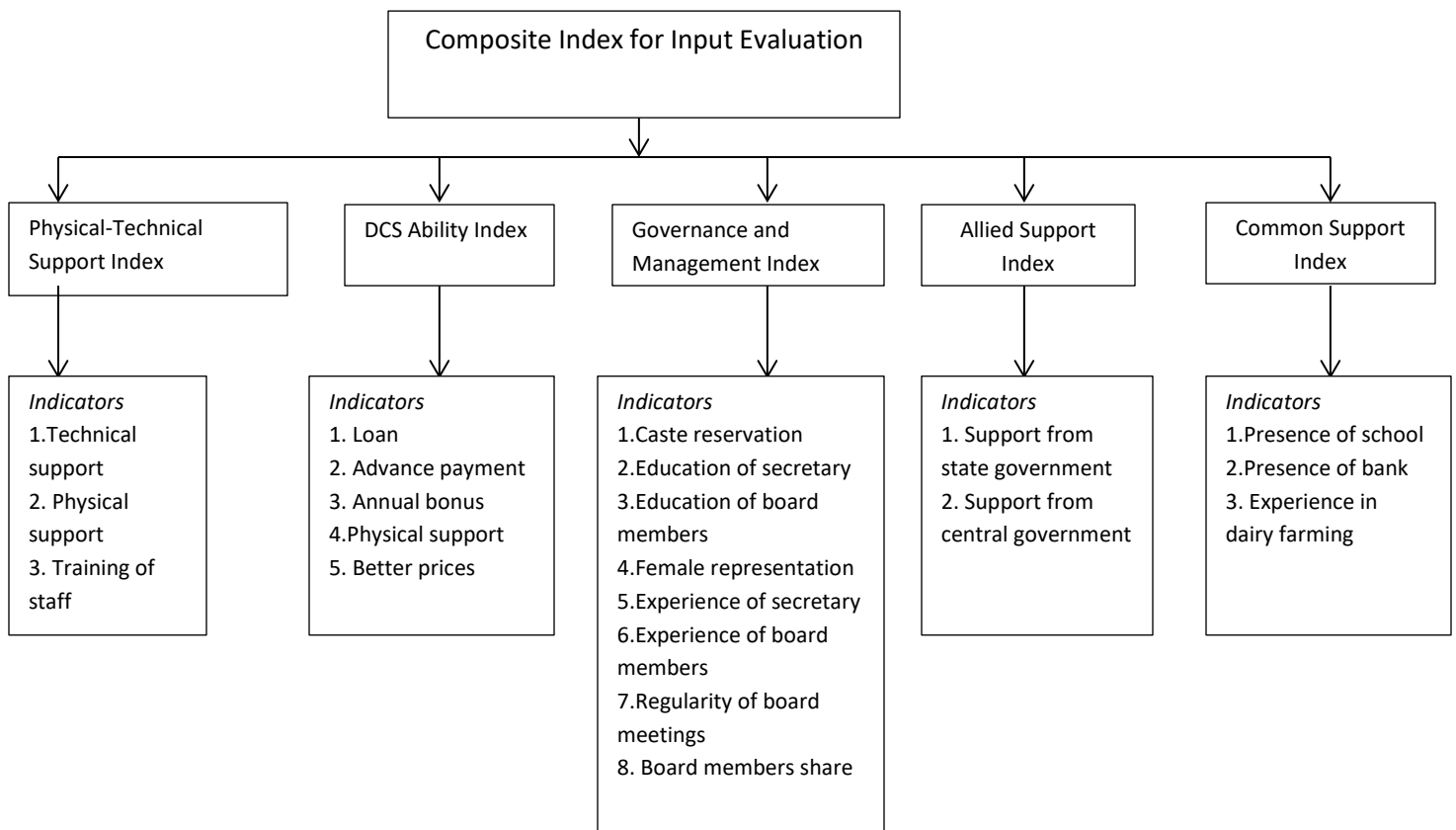
Fig 3.1: Analytical Hierarchy Model

3.1.2 Construction of questionnaire and pair-wise comparison matrix

After the construction of hierarchal problem from the overall goal to the lowest level of criteria for AHP analysis, questionnaire (APPENDIX)was constructed in such a way that pair-wise comparison at each level can be made to reflect the relative importance between elements at each level. outcome of these pair-wise comparisons shows the priority of an individual or group. For our study, we approached secretary of four successful DCS in Anand district of the state of Gujarat who has at least 10 years of experience in running the DCS.

The next step was to create pair-wise matrices at each level. The matrix 'A' is an nxn real matrix, where 'n' is the number of elements at a given level. Each entry 'aij', represents the importance of the ith element relative to the jth element or how important is the ith element in comparison to the jth element. If aij > 1 then the ith element is more important than the jth element, whereas if aij < 1 then the ith element is less important than the jth element, and if aij = 1 then both the ith and the jth elements are equally important. The entries aij and aji satisfy the following constraint:

$$aij*aji = 1$$

$$aii = 1, \text{ for all i}$$

The relative importance between two elements at each level is usually measured at a scale of 1 to 9 but we used 1 to 5 scale, as shown in table 3.1, although our responders were expert in their field but had little or no knowledge in answering over such vast range scale, which protected them from any confusion and for getting authentic response. The values or entries in the matrix show the pair-wise comparison between elements at every criteria level.

Table 3.1: Pairwise range and implication

Range	Implication
1	i and j are equally important
2	i is slightly more important than j
3	i is more important than j
4	i is strongly more important than j
5	i is absolutely more important than j

3.1.3 Construction of standardized matrix

Once the pair-wise comparison matrix A is formed then standardized matrix B can be formed using matrix A. Each entry bij of matrix B is computed as:

$$\text{bij} = \frac{aij}{\sum_{k=1}^{k=n} akj}$$

Where, numerator implies entries of each column of matrix A and denominator implies the sum of entries of each column.

3.1.4 Computing the vector of criteria weights

Finally, vector of criteria weights can be calculated by averaging each row of matrix B, i.e.

$$\text{w} = \frac{\sum_{l=1}^{l=n} ail}{n}$$

3.1.5 Checking the consistency

For computing the consistency, pair-wise matrix A is multiplied with vector of criteria weights. Then divide the resultant vector by the vector of criteria weights, i.e.

$$\text{rij} = \text{A.w}$$

$$\text{cij} = \text{rij/wi}$$

Consistency index of 'n' elements is calculated as follows:

$$\text{CI} = (\text{lamda} - \text{n})/\text{n-1}$$

Where, lamda is average of cij or the largest eigen value of nxn matrix. And, n implies the number of criteria or elements at given level.

Then, consistency ratio is calculated as follows:

$$\text{CR} = \text{CI/RI}$$

Where, CI implies consistency index and RI implies random index.

If CR <= 0.1, implies vector of criteria is acceptable or indicates the good level of consistency. If consistency ratio falls beyond the acceptable range then it is considered inconsistence for further usage. CR for overall goal and criteria index coming from different expert is show in Table 3.2.

Table 3. 2: AHP matrices and consistency ratio

Matrix	Size of Matrix	Consistency Index CI	Consistency Ratio	Acceptable CR
Overall Index				
Expert-1	5 X 5	0.0866	0.077	0.1
Expert-2	5 X 5	0.0977	0.087	0.1
Expert-3	5 X 5	0.0652	0.058	0.1
Expert-4	5 X 5	0.0787	0.070	0.1
Physical-Technical Support				
Expert-1	3 X 3	0.009	0.018	0.1
Expert-2	3 X 3	0.000	0.000	0.1
Expert-3	3 X 3	0.0046	0.009	0.1
Expert-4	3 X 3	0.000	0.000	0.1
DCS Ability				
Expert-1	5 X 5	0.0462	0.041	0.1
Expert-2	5 X 5	0.1121	0.100	0.1
Expert-3	5 X 5	0.0532	0.048	0.1
Expert-4	5 X 5	0.0478	0.043	0.1
Governance & management				
	8 X 8	0.0768	0.054	0.1
Expert-1	8 X 8	0.1302	0.092	0.1
Expert-2	8 X 8	0.1411	0.099	0.1
Expert-3	8 X 8	0.0522	0.037	0.1
Expert-4				
Allied support	2 X 2	0.000	0.000	0.1
	2 X 2	0.000	0.000	0.1
Expert-1	2 X 2	0.000	0.000	0.1
Expert-2	2 X 2	0.000	0.000	0.1
Expert-3				
Expert4				
	3 X 3	0.0371	0.0713	0.1
Common support	3 X 3	0.0371	0.0713	0.1
	3 X 3	0.0092	0.0176	0.1
Expert-1	3 X 3	0.0371	0.0713	0.1
Expert-2				
Expert-3				
Expert-4				

Table 3. 3: *Random consistency index*

Matrix Size	Random Consistency Index
1	0.00
2	0.00
3	0.58
4	0.90
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45
10	1.49

3.1.6 Global weights

As explained above, all of these were followed for every expert respondent. Subsequently, the mean of each expert's normalized weights at each hierarchal level gave us the global weights.

3.1.7 Detailed example of AHP analysis from expert 1:

Pair-wise comparison matrix for overall goal is shown in Table 3.4. To construct the pair-wise comparison matrix, the second step was followed (Construction of questionnaire and pair-wise comparison matrix) of AHP modeling.

Table 3.4: *Pair-wise comparison matrix for overall goal (efficiency)*

	Physical-Technical Support	DCS Ability	Governance and Management of DCS	Allied or Other Supports	Common Support
Physical-Technical Support	1.00	0.25	0.33	3.00	4.00
DCS Ability	4.00	1.00	1.00	4.00	4.00
Governance and Management of DCS	3.00	1.00	1.00	3.00	4.00
Allied or Other Supports	0.33	0.25	0.33	1.00	0.50
Common Support	0.25	0.25	0.25	2.00	1.00

Then, the process for the construction of standardized matrix was followed using above step 3. Standardized matrix is given below, Table 3.5.

Table 3. 5: Standardized matrix for overall goal

	Physical-Technical Support	DCS Ability	Governance and Management of DCS	Allied or Other Supports	Common Support
Physical-Technical Support	0.12	0.09	0.11	0.23	0.30
DCS Ability	0.47	0.36	0.34	0.31	0.30
Governance and Management of DCS	0.35	0.36	0.34	0.23	0.30
Allied or Other Supports	0.04	0.09	0.11	0.08	0.04
Common Support	0.03	0.09	0.09	0.15	0.07

Step 4 is used for computing the vector of criteria weights and it is shown in the Table 3.6.

Table 3.6: Relatives weights for criterions

Physical-Technical Support	0.1698
DCS Ability	0.3553
Governance and Management of DCS	0.3166
Allied or Other Supports	0.0716
Common Support	0.0867

Following the step 5 to check for consistency, Table 3.7 was constructed by multiplying pair-wise comparison matrix with weight matrix and then divided the resultant with weights matrix.

Table 3. 7: Resultant matrix for consistency analysis

Physical-Technical Support	5.4541
DCS Ability	5.5847
Governance and Management of DCS	5.5048
Allied or Other Supports	5.1107
Common Support	5.0770

Computation of consistency Index:

$CI = (lamda – n)/n-1$

Where, lamda is average of cij or the largest eigen value of nxn matrix. And, n implies the number of criteria or elements at given level.

$CI = (5.3463 – 5) / (5-1)$

$CI = 0.0866$

Then, consistency ratio is calculated as follows:

$CR = CI/RI$

$CR = 0.0866/1.12$

$CR = 0.077$

CR (0.077) < 0.1, implies vector of criteria is acceptable or indicates the good level of consistency.

Similarly, relative weights for all sub-criterions from expert-1 were calculated by replicating above steps show in Table 3.8 to Table 3.12.

Table 3. 8: Relative weights sub-criterions under criteria (Physical-Technical Support)

Technical support	0.3873
Physical support	0.4429
Training of staff	0.1698

Table 3. 9: Relative weights sub-criterions under criteria (DCS Ability)

Loan or loan guarantee to members	0.1061
Advance payment	0.0518
Annual bonus	0.2897
Physical support	0.2733
Better prices	0.2791

Table 3. 10: Relative weights sub-criterions under criteria (Governance and Management)

Representation of all castes in the board	0.0382
Education of secretary	0.2174
Education of board members	0.1214
Female representation in board	0.0553
Experience of secretary	0.2598
Experience of board members	0.1515
Regularity of meetings or board members in meetings	0.1039
Board members stake in DCS	0.0526

Table 3. 11: Relative weights sub-criterions under criteria (Allied or Other Supports)

Support from state government	0.5
Support from central government	0.5

Table 3. 12: Relative weights sub-criterions under criteria (Common Support)

Presence of schools in a village	0.6080
Presence of banks in a village	0.2721
Experience in diary	0.1199

3.1.8 Final weights for all the criterions and sub-criterions:

By following the AHP modeling steps mentioned above, weights for 5 criterions and all sub-criterions were calculated for data coming from other experts, all consistent (Table 3.2) weights were taken for the analysis. To calculate the final weights for criterions and sub-criterions, we took the average of particular parameters coming from different experts. Final weights for all the parameters (criteria or sub-criteria) used in the study for the evaluation of the efficiency of the DCS are given in Table 3.13 to Table 3.18.

Table 3. 13: Final weights for five criteria

	Weights (Expert 1)	Weights (Expert 2)	Weights (Expert 3)	Weights (Expert 4)	Final Weights	Final Weights %
Physical-Technical Support	0.1698	0.2520	0.4663	0.1979	0.2715	27%
DCS Ability	0.3553	0.4411	0.1452	0.1999	0.2854	29%
Governance and Management of DCS	0.3166	0.1686	0.2411	0.4746	0.3002	30%
Allied or Other Supports	0.0716	0.0830	0.0883	0.0738	0.0792	8%
Common Support	0.0867	0.0553	0.0592	0.0538	0.0638	6%

Table 3. 14: Final weights for sub-criteria (Physical-Technical Support)

	Weights (Expert 1)	Weights (Expert 2)	Weights (Expert 3)	Weights (Expert 4)	Final Weights	Final Weights %
Technical support	0.3873	0.4286	0.6327	0.3333	0.4455	45%
Physical support	0.4429	0.4286	0.1749	0.3333	0.3449	34%
Training of staff	0.1698	0.1429	0.1924	0.3333	0.2096	21%

Table 3.15: *Final weights for sub-criteria (DCS Ability)*

	Weights (Expert 1)	Weights (Expert 2)	Weights (Expert 3)	Weights (Expert 4)	Final Weights	Final Weights %
Loan or loan guarantee to members	0.1061	0.1009	0.0913	0.4040	0.1756	18%
Advance payment	0.0518	0.0557	0.0698	0.2626	0.1100	11%
Annual bonus	0.2897	0.2133	0.1759	0.1818	0.2152	22%
Physical support	0.2733	0.1814	0.2473	0.0995	0.2004	20%
Better prices	0.2791	0.4487	0.4157	0.0520	0.2989	30%

Table 3 16: *Final weights for sub-criteria (Governance and management of the DCS)*

	Weights (Expert 1)	Weights (Expert 2)	Weights (Expert 3)	Weights (Expert 4)	Final Weights	Final Weights %
Representation of all castes in the board	0.0382	0.0315	0.0331	0.0395	0.0356	4%
Education of secretary	0.2174	0.2618	0.2234	0.2957	0.2496	25%
Education of board members	0.1214	0.1882	0.0924	0.1334	0.1338	13%
Female representation in board	0.0553	0.0720	0.0525	0.0637	0.0608	6%
Experience of secretary	0.2598	0.1390	0.2444	0.2011	0.2110	21%
Experience of board members	0.1515	0.1470	0.0975	0.1199	0.1290	13%
Regularity of meetings or board members in meetings	0.1039	0.1120	0.1042	0.0953	0.1039	10%
Board members stake in dcs	0.0526	0.0485	0.1525	0.0513	0.0762	8%

Table 3.17: *Final weights for sub-criteria (Allied or other supports)*

	Weights (Expert 1)	Weights (Expert 2)	Weights (Expert 3)	Weights (Expert 4)	Final Weights	Final Weights %
Support from state government	0.5	0.5	0.5	0.5	0.5	50%
Support from central government	0.5	0.5	0.5	0.5	0.5	50%

Table 3.18: *Final weights for sub-criteria (Common Support)*

	Final Weights %
Presence of schools in a village	43%
Presence of banks in a village	16%
Experience in diary	41%

3.1.9 Construction of Composite Index:

Composite Index is an aggregation of various sub-indices constructed over various sub-criterion or indicators. Sub-indices were constructed over five criterions, namely, support received by the milk union, support given by the DCS to the dairy farmers, governance and management of DCS, allied or other support, and common support. Further these indices score were used to calculated global efficiency or overall goal or overall efficiency of the DCS.

For the evaluation of the efficiency of the DCS, we had collected data extensively over all the variables important for analysis and tested these over some very successful DCS in the country selected from 98 dairy cooperative societies formed under the scheme of NDP – I throughout the country. For the construction of index, we used all the variables affecting the efficiency of the DCS and variables on which data were available as these DCSs were formed recently, availability of data over the variables were not possible.

Sub-criteria index for Physical-Technical Support over 5-points scale:

$$NSCV_i = \frac{SCVi}{MAX(SCVi)}$$

$$SCI_l = \frac{\sum_{i=1}^{N}(NSCVi * FSCWi)}{N}$$

Where,

SCV_i = Value for ith sub-criteria or parameter
$NSCV_i$ = Normalized sub-criteria value
$FSCW_i$ = Final sub-criteria weight calculated using 5-points scale in Table 3.14
N = No. of sub-criteria

SI_l is evaluated over 98 DCS by using the AHP model. Top 10 and bottom 10 DCS with their ability score is shown in Table 3.19. From Table 19, we can see that the score of Iiavampadi

DCS is highest i.e., 0.57. The physical-technical support scores of all DCS have range from 0 to 0.57.

Table 3. 19: For criteria, Physical-Technical Support

Top-10 DCS (Village)	DCS Ability Score	Bottom-10 DCS (Village)	DCS Ability Score
Iiavampadi	0.567648	Raja Sheli	0.001552
Karsop	0.492422	Saran (L)	0.001035
Islampur	0.492135	Leharian	0.001035
Jasse Majra	0.472159	Nandgarh	0.001035
Bhikhanpur	0.469221	Chalheri	0.001035
Kola Narayanpur	0.465747	Gardinagar	0.001035
Tajanapur	0.455105	Ganganadodi	0
Dhulet	0.440399	Barputha	0
Rani	0.438754	Bhavath Chak	0
Devgarh	0.43838	Borsar	0

Sub-criteria index for DCS Ability over 5-points scale:

$$\text{NSCV}_i = \frac{\text{SCVi}}{MAX(SCVi)}$$

$$\text{SCI}_2 = \frac{\sum_{i=1}^{N}(\text{NSCVi} * \text{FSCWi})}{N}$$

Where,

SCV_i = Value for ith sub-criteria or parameter
NSCV_i = Normalized sub-criteria value
FSCW_i = Final sub-criteria weight calculated using 5-points scale in Table 3.15
N = No. of sub-criteria

DCS Abilityscores ranges from around 0.19 to 0.70as shown in the Table 3.20. The best DCS (Balia) is performing at the 0.70score. On the other hand, last DCS (Bhavrasi) is working at only at a score of 0.19. It means milk farmers at Bhavrasi DCS get less support relative to other DCS in our study.

Table 3. 20: DCS Ability Criterion

Top-10 DCS (Village)	DCS Ability Score	Bottom-10 DCS (Village)	DCS Ability Score

Balia	0.706006	Dhabala Rahwari	0.22487
Abiana Kalan	0.695369	Bhilkheda	0.221167
Lehrrian	0.656751	Mahu	0.216367
Iiavampadi	0.653803	Ganganadodi	0.214926
Chengadarahalli	0.591447	Majaratelikheda	0.214805
Kanthaneri	0.557725	Dhulet	0.212909
Boodhbalu	0.533808	Dharakheda	0.208352
Kheri Gurna	0.526444	Tajanapur	0.202383
Jase Majra	0.495119	Kasabkheda	0.202383
Gardinagar	0.492409	Bhavrasi	0.193638

Sub-criteria index for governance and management of DCS over 5-points scale:

$$\text{NSCV}_i = \frac{\text{SCVi}}{MAX(SCVi)}$$

$$\text{SCI}_3 = \frac{\sum_{i=1}^{N}(\text{NSCVi} * \text{FSCWi})}{N}$$

Where,

SCV_i = Value for ith sub-criteria or parameter
NSCV_i = Normalized sub-criteria value
FSCW_i = Final sub-criteria weight calculated using 5-points scale in Table 3.16
N = No. of sub-criteria
The top DCS (IIavampadi) is working with governance & has a management score of around 0.66 (Table 3.21). It has better governance and management than other DCS while Borsar has the weakest governance and management.

Table 3. 21: Governance & Management Criterion

Top-10 DCS (Village)	Governance and Management Scores	Bottom-10 DCS (Village)	Governance and Management Scores
Iiavampadi	0.657453	Rani	0.337241
Makanahally	0.621842	Nayakhedi	0.32693
Kelaganahally	0.582828	Majaratelikheda	0.299273
Dabri	0.575585	Marukheda	0.292935
Kishanpur Amkhoria	0.567792	Devgarh	0.291473
Abbalathy	0.567503	Mahu	0.243608
Kheri Gurna	0.560154	Kasabkheda	0.229993
Hittanahalli	0.55853	Bhavath Chak	0.227954

| Tajanapur | 0.556557 | Gavali Shivra | 0.226991 |
| Ram Nagar Sainia | 0.551771 | Borsar | 0.173202 |

Sub-criteria index for allied or other support over 5-points scale:

$$NSCV_i = \frac{SCVi}{MAX(SCVi)}$$

$$SCI_4 = \frac{\sum_{i=1}^{N} NSCVi * FSCWi}{N}$$

Where,

SCV_i = Value for ith sub-criteria or parameter
$NSCV_i$ = Normalized sub-criteria value
$FSCW_i$ = Final sub-criteria weight calculated using 5-points scale in Table 17
N = No. of sub-criteria

It is shown in the Table 3.22, the score of allied support sub-index ranges around from 0 to 0.90. It means number of programs or schemes from state and central government with dairy farmers associated is relatively less in the poor performing DCSs than better performing DCSs.

Table 3. 22: Allied Support Criterion

Top-10 DCS (Village)	Allied Support Score	Bottom-10 DCS (Village)	Allied Support Score
M Shettahalli	0.9	Lehrrian	0.190909
Bilagunda	0.772727	Gardinagar	0.190909
Hittanahalli	0.772727	Barputha	0.181818
Abbalathy	0.772727	Tajanapur	0.181818
Byadara Biluguli	0.772727	Lalakhedi	0.145455
Nandipura	0.772727	Dharakheda	0.145455
Makanahally	0.772727	Borsar	0.136364
Chengadarahalli	0.772727	Kasabkheda	0.136364
Jinakanahally	0.772727	Islampur	0.045455
Sanyasipura	0.727273	Bhavath Chak	0

Sub-criteria index for common support over 5-points scale:

$$NSCV_i = \frac{SCVi}{MAX(SCVi)}$$

$$SCI_5 = \frac{\sum_{i=1}^{N} NSCVi * FSCWi}{N}$$

Where,

SCV_i = Value for ith sub-criteria or parameter
$NSCV_i$ = Normalized sub-criteria value
$FSCW_i$ = Final sub-criteria weight calculated using 5-points scale in Table 3.18
N = No. of sub-criteria

The best performing DCS (Manikpur Bujurg) is working at a common support score of around 0.62 (Table 3.23) in terms of having greater common support such as schools, banks, and experience in dairy farming. Common support sub-criteria index for last DCS (Ganganadodi) having score of around 0.01 (Table 3.23). It means Ganganadodi has least common support relative to all other DCS taken for study.

Table 3. 23: Common Support Criterion

Top-10 DCS (Village)	Common Support Score	Bottom-10 DCS (Village)	Common Support Score
Manikpur Bujurg	0.628491	Silari	0.10263
Pachrukhi	0.607238	Bhavrasi	0.101202
Bhavath Chak	0.589618	Marukheda	0.098347
Sabar	0.585498	Sanyasipura	0.096919
Harchandi	0.564571	Lalakhedi	0.096919
Iiavampadi	0.528391	M Shettahalli	0.092636
Patniya	0.507275	Jinakanahally	0.062818
Rani	0.500802	Nandipura	0.052824
Karsop	0.480312	Moahally	0.039975
Islampur	0.478108	Ganganadodi	0.009994

Composite index (CI) for overall performance of the DCS:

$$CI = \sum_{i=1}^{n}(SCIi * FCWi)$$

where,
SCI = Sub-criteria index
FCW = Final criteria weight calculated using 5-points scale in Table 3.13
n = No. of criterions

The overall index or composite index is shown in Table 3.24. The score ranges between 0.13 and 0.61. The best performing DCS (IIavampadi) has a score of around 0.61 indicating in

aggregation of all the indicator variables or considering all the indicator variables. Iiavampadi DCS has gap of 0.39 to improve its operations, whereas the least performing DCS (Borsar) has a gap of0.86 as a scope for improvement.

Table 3. 24: For Overall Index

Top-10 DCS (Village)	Composite Score	Bottom-10 DCS (Village)	Composite Score
Iiavampadi	0.6099	Bhavrasi	0.246628
Balia	0.496952	Nipur	0.240118
Karsop	0.460823	Barputha	0.230447
Ram Nagar Sainia	0.454838	Mahu	0.230228
Abiana Khurad	0.453738	Raja Sheli	0.220038
Jasse Majra	0.452265	Ganganadodi	0.202561
Kanthaneri	0.447059	Majaratelikheda	0.190318
Chengadarahalli	0.437769	Bhavath Chak	0.18682
Boodhbalu	0.413803	Kasabkheda	0.168994
Bylakuppa	0.408303	Borsar	0.144276

3.2 DEA Results and discussion:

Based on the inputs generated from the AHP analysis and the outputs, efficiency scores and the ranks of the DCS were estimated. The inputs and Outputs applied in the study are as given below in table 3.25.

Table 3. 25: Inputs and Outputs for DEA

Inputs	Outputs
Physical-Technical Support Index	Milk Intensity Measure
DCS Ability Index	DCS Membership Intensity Measure
Governance and Management Index	
Allied Support Index	
Common Support Index	

A five-input, two-output Data Envelopment Analysis model is designed for this evaluation. We applied the standard constant return to scale, single stage and input oriented model for the analysis. The output variables in the study were average milk collected per member which acts as

milk output intensity variable and average members per household in the village which acts as membership intensity variable. The analysis provided the weighted efficiency scores and the ranks. The higher the efficiency scores, the higher is the probability of the DCS to sustain. Thus, the top 20 would have very high likelihood of sustaining in the longer run and the bottom 20 would have difficulty in sustaining.
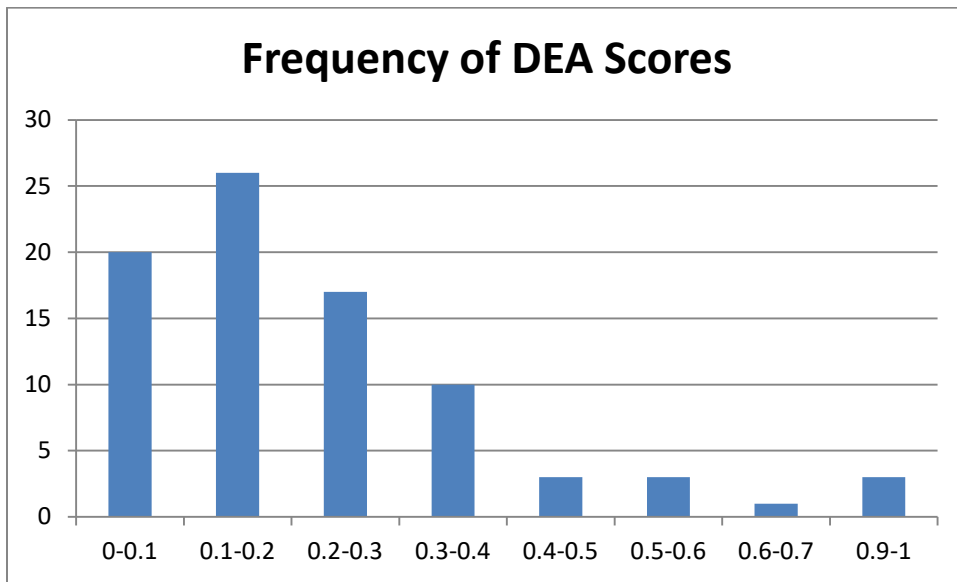
Fig 3. 2: Frequency of DEA Scores of DCS

Thus, we can see above the frequency distribution of the DCS as per the performance. Based on the above distributions and using means and standard deviations, we can classify the DCS in low, medium and high performing DCS. The numbers are as follows and are provided in table 3.26, 3.27 and 3.28:

High performing DCS: 17

Medium performing DCS: 41

Low performing DCS: 40

Table 3.26: High Performing DCS

Village	District	State
Moahally	Chamarajanagar	Karnataka
Phulere	Ropar	Pubjab
Gawli Shivra	Aurangabad	Maharashtra

Bilagunda	Periyapatna	Karnataka
Byadara Biluguli	Periyapatna	Karnataka
Jasse Majra	Ropar	Pubjab
Chantha	Begusarai	Bihar
Chowdenahally	Periyapatna	Karnataka
Emadpur	Begusarai	Bihar
Saraukh	Bhagalpur	Bihar
Bhagwanpur Sikandar	Begusarai	Bihar
Abiana Kalan	Ropar	Pubjab
Ranchandarpur	Begusarai	Bihar
Leharian	Ropar	Pubjab
Nandipura	Periyapatna	Karnataka
Sanyasipura	Periyapatna	Karnataka
Ahila	Darbhanga	Bihar

Table 3.27: *Medium Performing DCS*

Village	District	State
Hittanahalli	Periyapatna	Karnataka
M Shettahalli	Periyapatna	Karnataka
Dabri	Ropar	Punjab
Dharni Patty	Darbhanga	Bihar
Chikkindvadi	Chamarajanagar	Karnataka
Kheri Ghurana	Patiala	Punjab
Saran (L)	Ropar	Punjab
Rahema	Khagriya	Bihar
Kelaganahally	Periyapatna	Karnataka
Chengadarahalli	Chamarajanagar	Karnataka
Chandpur	Banka	Bihar
Cmtha Vishanpur	Begusarai	Bihar
Abiana Khurd	Ropar	Punjab
Dhulet	Ujjain	Madhyapradesh
Thammadahally	Periyapatna	Karnataka
Nipur	Begusarai	Bihar
Sipawra	Ujjain	Madhyapradesh
Jamaiyachar	Banka	Bihar
Jinakanahally	Chamarajanagar	Karnataka
Boodhbalu	Chamarajanagar	Karnataka
Nandgarh	Patiala	Punjab

Karharia	Bhagalpur	Bihar
Illavanpadi	Vellor	Tamilnadu
Makanahally	Periyapatna	Karnataka
Islampur	Banka	Bihar
Babhan Korama	Banka	Bihar
Nayakhedi	Ujjen	Madhya Pradesh
Khojewadi	Aurangabad	Maharashtra
Bylakuppa	Periyapatna	Karnataka
Rani	Begusarai	Bihar
Gamhariya	Darbhanga	Bihar
Chalheri	Patiala	Punjab
Gaikwad Wadi	Aurangabad	Maharashtra
Abbalathy	Periyapatna	Karnataka
Kandaveli	Vellor	Tamilnadu
Bhatani	Darbhanga	Bihar
Ram Nagar Sainia	Patiala	Punjab
Silari	Ujjain	Madhyapradesh
Tajanapur	Aurangabad	Maharashtra
Bhikhanpur	Bhagalpur	Bihar
Rajpur	Banka	Bihar

Table 3.28: *Low Performing DCS*

Village	District	State
Marukheda	Ujjain	Madhyapradesh
Gardinagar	Patiala	Punjab
Bhilkheda	Ujjain	Madhyapradesh
Gangti	Banka	Bihar
Mahu	Ujjain	Madhyapradesh
Punsia	Banka	Bihar
Harchandi	Banka	Bihar
Patwa	Banka	Bihar
Kusmi	Banka	Bihar
Devgarh	Banka	Bihar
Dhabala Rahwari	Ujjain	Madhyapradesh
Dastola Sajaur	Bhagalpur	Bihar
Khurchnya Pratab	Ujjain	Madhyapradesh
Pachrukhi	Bhagalpur	Bihar
Raja Sheli	Darbhanga	Bihar

Kishanpur Amkhoria	Bhagalpur	Bihar
Balia	Darbhanga	Bihar
Karsop	Banka	Bihar
Manikpur Bujurg	Bhagalpur	Bihar
Kohat	Darbhanga	Bihar
Singhnan	Banka	Bihar
Rampur Dih	Bhagalpur	Bihar
Kola Narayanpur	Bhagalpur	Bihar
Radha Nagar	Bhagalpur	Bihar
Sabar	Kaimur	Bihar
Bhulni	Bhagalpur	Bihar
Huthur	Chamarajanagar	Karnataka
Patniya	Darbhanga	Bihar
Manjhagayn Mahila	Banka	Bihar
Birniya	Darbhanga	Bihar
Darpa	Banka	Bihar
Barputha	Banka	Bihar
Ganganadodi	Chamarajanagar	Karnataka
Bhavath Chak	Banka	Bihar
Borsar	Aurangabad	Maharashtra
Kasabkheda	Aurangabad	Maharashtra
Bhavrasi	Ujjain	Madhyapradesh
Lalakhedi	Ujjain	Madhyapradesh
Dharakheda	Ujjain	Madhyapradesh
Majaratelikheda	Ujjain	Madhyapradesh

To evaluate the effect of the input variables on the output variables, we conduct a regression analysis. This analysis will provide us insights to see which input variable is affecting the output variable more compared to the other. Hence, it is able to explain the reasons for different levels of performance by the DCS in the study. We regress the inputs alongwith their squared terms on the weighted outputs.

The regression equation is as follows:

$$y = \beta_0 + \beta_1 i_1 + \beta_2 i_2 + \beta_3 i_3 + \beta_4 i_4 + \beta_5 i_5 + \beta_6 i_1{}^2 + \beta_7 i_2{}^2 + \beta_8 i_2{}^2 + \beta_9 i_3{}^2 + \beta_{10} i_4{}^2 + \beta_{11} i_5{}^2 + \epsilon$$

where βs are the coefficient, y is the weighted output variable (weighted score of milk intensity measure and DCS membership intensity measure), i_1 is the physical technical support index, i_2 is the DCS ability index, i_3 is the governance and management index, i_4 is the allied support index and i_5 is the common support index.

The results are given below in fig 3:

VARIABLES	Model 1
i1	10.07***
	(3.793)
i2	15.26
	(9.677)
i3	-31.47**
	(14.09)
i4	-4.357
	(4.119)
i5	9.804*
	(5.717)
i1^2	-17.25**
	(7.850)
i2^2	-11.24
	(11.51)
i3^2	31.97*
	(16.65)
i4^2	2.683
	(4.357)
i5^2	-18.52**
	(8.814)
Constant	5.264*
	(3.161)
Observations	98
R-squared	0.306

Standard errors inparentheses
*** p<0.01, ** p<0.05, * p<0.1

Fig 3. 3: Regression analysis

The results suggest that except the Allied Support Index, all the other indices significantly affect the output. The regression analysis suggests that Governance and management starts affecting the output after the governance and management index values are higher. The results suggest that even though efforts in improving this index in early stages might not have significant effects on the output but would starts showing positive effects if persisted with. Physical-Technical support index has a significantly positive effect on the DCS performance. However, beyond a certain level, it is not creating value for the DCS. Thus, support from the milk union effects only till a certain level and the milk union can restrict their engagements with the DCS. Ability of the DCS itself has significant consistent positive effects on the performance of the DCS.

4. Case-Study Analysis

This analysis presents a synthesis of the case-studies prepared for 20 DCSs, a mix of better ranked as well as low ranked DCS in the sustainability analysis presented in the earlier chapters of this report. We have incorporated a couple of DCSs in our analysis that are either defunct now or on the verge of becoming defunct. The analysis encompasses current operational details of the DCS, its governance and management, support provided to its members, critical linkages established by the DCS, and challenges faced by the DCS. This analysis will point out the critical issues that are important to be considered for providing better prospects for the sustainability of newly formed DCS under NDP-I. While analyzing these cases, we have cautiously avoided comparing these DCSs with the well-established DCSs (many of them are six to seven decades aged) in the state like Gujarat. Readers need to keep in mind that the DCSs under analysis are barely 4-5 years old and are still trying to set their roots. Following are the observations on selected points that have been considered for computing sustainability index for the DCSs selected for this study.

4.1 Membership:

Expansion of membership base is necessary for the DCSs to keep themselves relevant not only economically but also socially. While non-members can also sell milk to DCS and get benefits that are available to them, such people cannot participate in the governance of the DCS, which means that they will not be part of collective decision making. Initial observations indicate that newly formed DCSs have started participating in local cultural and social events. Such participation is being observed in the form of providing milk to students of local schools during the Independence as well as Republic Day, providing milk for the community festival, providing financial support for local cultural, community and religious events. Some DCSs in Karnataka also support local literary events (*Sahitya Sangam*). Such engagements are necessary for the DCS to generate bonding capital in the society, establish its relevance and keep its membership intact. It is necessary for the newly formed DCSs to increase its membership base in the area of their operations. We found that current state of membership is quite low. Our survey data indicates that average number of households in per DCS is 250 and average number of DCS members is 67. This works out to be 26.89 percent (Table 4.1). This means that there is a great

scope for the DCS to increase its membership base in their respective operational areas. We observed that all the DCS included in the case analysis have not initiated any drive to increase the membership. It is prudent that DCSs initiate such drive for some designated period once in a year. This can happen despite the events organized by the Milk Union every year. Milk Union can support DCS organize or initiate such drives, in whichever way possible.

Table 4. 1: Membership Coverage in the Sampled DCS

States	No of sampled DCS	Total Households in the villages covered by DCS	Total no of DCS members (2017-18)	% Coverage of membership
Karnataka	19	5613	2181	38.86
Bihar	46	7850	1858	23.67
Madhya Pradesh	13	1533	309	20.16
Maharashtra	6	3580	134	3.74
Punjab	12	2417	593	24.53
Tamil Nadu	2	3500	1510	43.14
Total	**98**	**24493**	**6585**	**26.89**

Another related but important issue is about relationship of the DCS with the non-members who pour milk in the DCS. We found that non-members can avail all benefits, except bonus, that are available to its members. There are both positive and negative aspects of allowing non-members to pour milk. Positive aspect is that non-members help DCS in maintaining higher milk procurement levels. However allowing non-members to pour milk and to avail the benefits poses a relevant question: *what would be the motivation for the non-member to become regular members of the DCS if bonus/profit is not significant?* Being a non-member, an individual can sell milk to non-DCS entity as well without facing any moral dilemmas as well as any institutional sanctions from the DCS, if such sanctions are present. In some cases, such as Punjab, DCSs allow non-members to pour milk for a year and then makes it mandatory for them to subscribe the DCS membership (Table 4.2). However, such provisions are absent in other places. This calls upon a need to address non-member issue with some seriousness.

Table 4. 2: Non-Members

States	No of sampled DCS	Total no of DCS members (2017-18)	Total number of non-members pouring milk (2017-18)	Total milk pouring members (members + non-members)	% of mon-members with respect to total milk pouring members
Karnataka	19	2181	283	2464	11.49
Bihar	46	1858	137	1995	6.87
Madhya Pradesh	13	309	416	725	57.38
Maharashtra	6	134	173	307	56.35
Punjab	12	593	112	705	15.89
Tamil Nadu	2	1510	90	1600	5.63
Total	**98**	**6585**	**1211**	**7796**	**15.53**

4.2 Governance

Governance is a critical aspect of DCS sustainability. We found, in most of the cases, governing bodies of the DSCs represent social configuration of the village in terms of representation of caste and other social aspects. In non-all-women DCS, representation of women in the governing bodies is about 32 percent, which is comparable with a norm that is usually adopted to describe fair representation of women (33 percent) in public and community bodies. We also observed in the selected most of the cases that monthly meetings of the governing bodies as well as annual general body meetings takes place on a regular basis. However, the survey data of entire sampled DCS indicate that on an average the governing body of a DCS met 7 times in 2016-17.

Table 4. 3: Participation of Directors in the Board Meetings

States	No of sampled DCS	Total Number of Board Meetings in 2016-17	Average number of board meetings per DCS in the year 2016-17
Karnataka	19	134	7.05
Bihar	46	310	6.73

Madhya Pradesh	13	130	10
Maharashtra	6	36	6.0
Punjab	12	87	7.25
Tamil Nadu	2	11	5.5
Total	**98**	**708**	**7.22**

A quick review of the agenda points of such meetings reveals that the discussions in these meetings are limited only to the bare minimum governance requirements of the DCS (Table 4.3). Most common topics that are discussed in the general body meetings are presentation of auditor's report, selection/appointment of new auditor and approval of annual budget for the DCS. Though not very often, members do discuss issues such as quality of milk, payment for sold milk, etc. The governing bodies of some high ranked DCSs have taken effective steps in developing DCS's infrastructure, such as own building and other assets. But such instances are rare. There is hardly any discussion on future plans, how to take the DCS forward, how to increase membership, and what innovation can be brought to take the business of the DCS forward. We may require refresher trainings for the governing body members and active campaigning for the members in such a way that they go beyond the daily operational issues of the DCS and discuss other crucial issues and further prospects, including active involvement of the DCS in local social and cultural events.

We observed that most of the governing bodies have been appointed or selected unanimously. This indicates a positive sign in terms of presence of social capital and coherence among the members of the DCS. This has been established very well in the collective action literature that more structural coherence leads to better performance of the collection action organizations. However, unanimous selections do not offer opportunities for the members to select the people in the Board who have better vision and plans to take the DSC forward. Instead, elections provide such opportunities. Elections also dent the possibility of re-election of those governing body members who do not perform better during their tenure. Which means governing body members will have to be cautious about their performance in order to prove their worth. It should not be mistaken that we are trying to suggest that elections are better than unanimous selections. However, this observation might lead a debate further in terms of role of elections in ensuring sustainability of DCSs.

4.3 Critical linkages, support provided by the DCS to its members and local community

The DCS support its members in two ways: 1) the support that has high economic cost and is provided by the Milk Union, through the DCS, to DCS member and 2) support provided by the DCS to its members as well as the local community. The support provided by the Milk Union through DCS is about subsidized services that include mineral mixture, cattle feed, ration advice, AI services, veterinary services, insurance of DCS members as well as cattle. This support is crucial for the members to be able to improve quality and quantity of the milk. Such support from the Milk Union saves DCS members from multiple economic shocks driven by market instability. Suppose if members are transacting with the market directly, they are subject to adjust their economic conditions as well as market instability in their transactions. This may limit members' ability to remain consistent in maintaining quality and quantity of the milk. Since support (including subsidies) provided by the Milk Union is consistent and does not vary based on day to day market conditions, critical linkages save members' exposure towards market volatility. DCSs also provide some support to their members in terms of flexible payment schedules, advance payment, etc. However, more significant contribution should be made by the DCS towards local social and cultural community events. This contribution is critical for the DCS to maintain its social relevance as a community institution. Though most of the DCSs, according to their economic health, make such contributions, few DCSs do not have active social involvement. These DCSs must be encouraged to actively participate in the socio-cultural aspects of the community in order to grow and establish within the society.

4.4 Innovations and use of Technology

The role of technology and innovation is very important in making DCS's operations effective and also establishing trust among its members. Since the DCSs considered for this study as well as for case analysis are quite young, they still need to adopt cutting edge technology to make their operations effective and transparent. For example, most of the DCS do not have computers to register milk sample of every member and provide them a receipt. Similarly, there is dearth of computer enabled systems to test the fat content and eliminate members' concern about measuring the quality of milk. Though it may be unfair for the newly formed DCSs if we expect them to be equipped with such technology in a short period of time, but it is imminent on Milk Union's part to arrange for these enablers. As of now, DCSs are devoid of such development.

4.5 Capacity Building

It is worthy to note that almost all the DCS have gone through necessary capacity building exercise. All the Secretaries as well as other staff have received first trainings and few of them have received refresher trainings as well. This has helped them to run DCS operations smoothly. However, we felt a need of orienting DCS members as well as non-members on dairy related issues, non-dairy role of the DCS, and collective governance. *The trainings must go beyond producing quality milk.* Better orientation of the members would encourage them to support the DCS in very effective manner. For example, in one of the DCS, the Secretary shared difficulties in convincing the DCS members not to add water in the milk. This practice ultimately hampered their prospects of getting fair prices. Better orientation of the members might be helpful in addressing such issues.

Another area where capacity building of DCS functionaries is inevitable is the record keeping. We have studied Auditor's comments on the auditing processes of the DCS wherever such evaluation was available. The major observation that auditors have provided is pertaining to failure of the DCS in maintaining the records properly, particularly the payment slips. Accounting hygiene is one of the important aspects of transparency and efficiency.

4.6 Future Challenges

It is difficult to say if the DCSs established under NDP-I have become sustainable or not. However, it may be determined if these DCSs have better sustainability prospects. The DCSs have to prioritize and pay attention to some aspects in short term while certain issues should be addressed in a long term. Short term priorities include, developing necessary assets and adopting minimum but necessary technology in its operations, expanding membership base, and encourage members to maintain milk production.

Long terms attention must be focused on effective governance practices and enhanced role of the DCS in non-dairy social and cultural matters, which ultimately provide validity to DCS in the society. Greater and consistent volume of milk procurement and higher number of memberships are certainly major outcomes, however increased role of the DCS in community life and its relevance as a social institution would provide it longevity, hence a sustainable future.

5. Welfare Impacts of participation in DCS

It is anticipated that DCS membership is akin to market connectedness. It introduces the discipline of market in dairy activities for households and enhances their competence to take welfare enhancing decisions. This chapter seeks to estimate the welfare impacts of NDP-I on DCS households.

5.1 Sample Selection

In order to evaluate the welfare impacts of NDP- I we conducted household and village level surveys. We reached 300 households from 27 villages located in Darbhanga district of Bihar. Our sample includes treatment and comparison group households in almost 1:1 ratio.

5.1.1 Sampling Strategy:

Bihar was purposively selected for our study because a major part of the population here is engaged in agriculture and milk farming; however it continues to have one of the lowest milk productivity in India. We selected Samastipur milk union (Darbhanga) for our site of study where largest number of NDP-I villages are located. This was the first milk union to have received the support in Bihar under NDP-I.

17 NDP-I villages in Darbhanga district were selected, while 10 control villages were selected. The survey was conducted in an exhaustive manner to capture all the welfare aspects of rural households. All the selected households in the study were such which had five or lesser number of milch cattle and had been in the dairy business for more than a year. We canvassed the survey to husband and wife of the household who were primarily earners of the household. Control households are similar to program households in terms of the number of milch animals, dairy experience and other constraints but do not have the facility of the DCS in their village. To sell the milk, their market is limited to a few households in the village.

We used matching methods for village selection over a range of village level variables extracted from the 2011 Census. Variables were chosen based on the literature review made by our research team over similar studies for PSM models. PSM is technique used for the identification of counterfactual (control) using baseline characteristics which we think can influence the

program outcomes or the program selection. Table 5.1 represents the balanced table and the P-value tell us that there is no significant difference between treated and control villages on given variables in the matched group, unlike the unmatched group. Fig 4.1 gives the distribution of matched samples, which implies that there are villages on the common support region from both treatment and control villages.

Matching the propensity score has two main assumptions:

1) *Conditional independence assumption:* It means treatment assignment is independent of potential outcomes after controlling of baseline covariates.

    $(Y(1), Y(0)) \perp Z|X$

    Where, Y is potential outcomes, Z is treatment assignment and X implies the baseline characteristics.

2) *Common support assumption:* It means every element has positive probability of receiving either of the treatment when controlling thebaseline characteristics. Or, common support ensures that conditional on 'X' treated units have neighboring comparison units in the propensity score distribution.

    $0 < P(Z=1|X) < 1$

Under these assumptions, once the matching is done and matched sample has been formed then treatment effect can be directly estimated by comparing the treated and controlled matched sample or the estimate of average treatment effect will be consistent as follows:

$$ATT = E[Y(1)|Z=1] - E[Y(0)|Z=1]$$

Table 5. 1*: Balanced table over matched variables using PSM for the village selection in the Darbhanga district within selected blocks, namely, Manigachhi and Kusheshwarsthan*

| Variable	Unmatched	Mean		%	%reduction	P-value
	Matched	**Treated**	**Control**	bias	Bias	
Total No. of households in a village	U	935.78	653.45	33.0	90.2	0.094
	M	716	743.79	-3.3		0.898
Total population of a village	U	4535.6	3128.2	34.2	88.6	0.087
	M	3409.6	3570.6	-3.9		0.874
Proportion of female population	U	.48057	.47975	4.8	-13.4	0.846
	M	.48122	.48029	5.4		0.837
Population under the age of 6 years	U	821.85	601.37	30.3	85.9	0.139
	M	623.19	654.26	-4.3		0.861
SC Population in a village	U	667.67	498.86	21.3	70.2	0.260
	M	464.52	514.88	-6.4		0.754
ST Population in a village	U	10.63	2.4302	46.1	91.6	0.005
	M	5.1905	4.5048	3.9		0.847
Female literate population	U	745.15	502.88	31.3	89.4	0.114
	M	558.52	584.1	-3.3		0.896
Total working Population	U	1444.6	996.19	37.0	86.6	0.062
	M	1093.2	1153.4	-5.0		0.842
Proportion of female working population	U	.23238	.26284	-21.9	55.5	0.337
	M	.22452	.23807	-9.7		0.756
Proportion of female literate population	U	.34596	.34689	-2.1	-109.3	0.929
	M	.34613	.34419	4.3		0.890
Female population working as an agricultural laborer	U	67.074	46.558	24.7	96.9	0.226
	M	55.714	56.352	-0.8		0.979
Female population working in household industry	U	12.852	3.9767	34.6	94.5	0.044
	M	6.6667	7.1524	-1.9		0.936
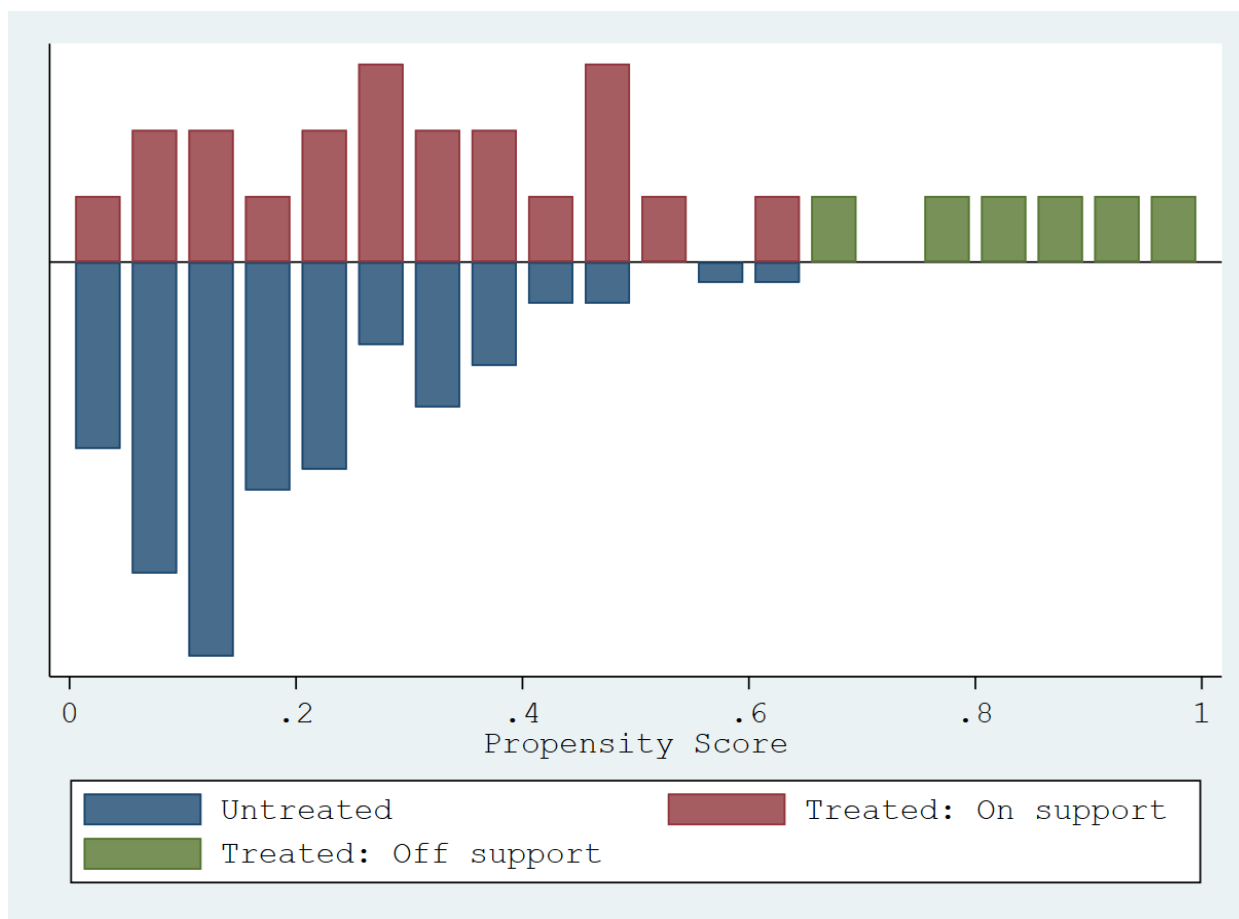
Fig 5 1: Distribution of Treatment and Control Villages

Table 5 2: Logit result: Village Level Balance

Total No. of households in a village	- 0.0105278**
	(0.0045897)
Total population of a village	0.0052054**
	(0.00233)
Proportion of female population	22.46916
	(19.55833)

Population under the age of 6 years	-0.0127369**
	(0.0055754)
SC Population in a village	-0.0002773
	(0.0008848)
ST Population in a village	0.0748703**
	(0.0332071)
Female literate population	-0.0072396**
	(0.0035461)
Total working Population	0.0017818
	(0.0021658)
Proportion of female working population	-3.429222
	(2.798744)
Proportion of female literate population	0.0505092
	(8.981775)
Female population working as a agricultural laborer	0.0007748
	(0.0040893)
Female population working in household industry	0.0241169*
	(0.0141337)

Standard errors in parenthesis *** p<0.01, ** p<0.05, * p<0.1

Table 5.2 shows the likelihood of treatment over various variables. Most covariates are not influencing the likelihood of treatment expect for few.

Figure 5.2 presents the distribution of estimated propensity scores and it indicates that there is an overlap in the propensity score distribution across the treatment and control villages.
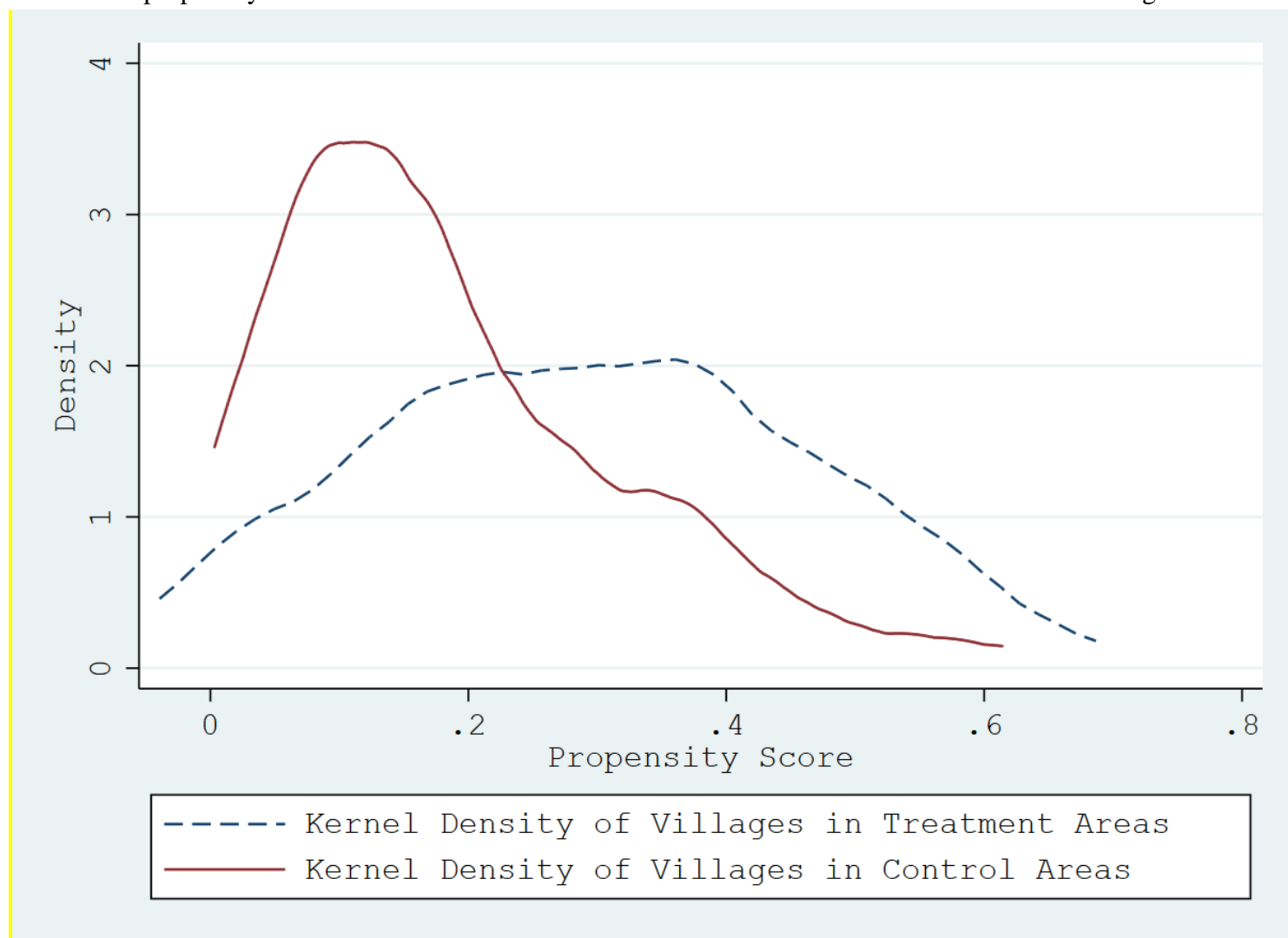
Fig 5 2: Kernel Density

This study investigates the relationship between household market participation and outcome & empowerment indicators. Households who sell raw milk to dairy cooperatives, processing companies, hotel and cafeterias are considered as treated household, whereas households who did not sell raw milk or have sold to very few household for consumption purpose were considered as control households. In total 300 households were selected randomly; 150 coming from treatment villages and rest 150 coming from control villages. Sampling of households in

our study was specific to households who were engaged into dairy farming at least for a year and having not more than 5 milch aminals.

The matching procedure provided us with a total of 27 villages of which 17 were treatment villages and rest 10 were control villages.

Table 5.3, below provides the summary statistics for selected samples on important village variables taken from census 2011. P-value in the last column implies that there is no significant difference between treatment and control villages on any of these variables.

Table 5. 3: Summary Statistics

Variable	Obs	Treatment Villages		Obs	Control Villages		(Treatment – Control)	
		Mean	SD		Mean	SD	Coeff.	P-Value
Total No. of household	5	920.4	1210.72	5	625.2	442.49	295.2	0.6302
Total Population	5	4074.4	5106.39	5	2957.4	1816.521117		0.6643
Population under 6 years of age	5	687.2	805.67	5	518	263.74	169.2	0.6746
SC population	5	497	816.27	5	347	241.42	150	0.7108
ST population	5	2.8	6.26	5	0.6	0.54	2.2	0.4769
Literate population	5	2036.6	2607.4	5	1416	816.83	620.6	0.6341
Total working population	5	1251.0	1539.07	5	961.4	827.35	289.8	0.7232
Female population working as a agricultural labor	5	38	44.02	5	72.8	89.37	-34.8	0.4653

Female population working in a household industry	5	18.8	40.92	5	1	1.41	17.8	0.3860
Total non-working population	5	2823.2	3570.04	5	1996	1024.16	827.2	0.6411
Proportion of female Population	5	0.4824	0.015	5	0.4892	0.0207	-0.0067	0.5726
Proportion of female working population	5	0.2310	0.1577	5	0.2106	0.1322	0.0203	0.8306
Proportion of female literate Population	5	0.3493	0.0533	5	0.3972	0.052	-0.0479	0.1885

5.3 Survey Design:

The questionnaire was designed to capture all the relevant information on factors such as consumption, income, health, education, financial maturity, savings, societal, mechanism upheld during catastrophe, women's status etc., which constitute outcome indicators (i.e.s, welfare of a household).

Survey questionnaire was divided into several schedules to capture information on all the important factors as mentioned above. Besides this an experiment was conducted following Lenjiso, Smits & Ruben (2016) to understand, how the bargaining power of women in NDP-I households has changed due to the formal market intervention.

Experimental Design

Bargaining power in the household refers to the share of total pool of resources one holds in the household. Similarly, bargaining power between spouses determines each spouses' share in the total resources available. Women's ability to bargain or using the agency to maximize their resource share in the household is key indicator of empowerment.

 In our experiment, players, husband and a wife - from the randomly selected household, participated in this game which tried to mimic the social structure of the household. Husbands

and wives were asked to divide the fixed amount of money given to them between themselves and their partners, whereby, agreement between husbands and wives regarding the amount of money given to each other would determine if they win the game or not. For smoothly conducting the experiment, each player (husband or wife) were given Rs. 170, which is nearly equivalent to the daily wage rate (Rs. 168) under MGNREGA (The Mahatma Gandhi National Rural Employment Gaurantee Act, 2005), in the state of Bihar where this experiment was conducted. In our game, each player played two roles 1) Proposer - in this role a player proposed an amount s/he wanted to share with their partner and 2) Receiver - in this role a player indicated by writing an amount on a paper s/he expected from their partner. Only those couples were considered as wining couples whose proposed and expected amounts coincided. As a token of appreciation, each winning couple was awarded with a sum of Rs. 340 which is double of the participation amount.

It was assumed in our game that the amount proposed and expected by the spouses would show or mimic the real household interaction between them which would show the bargaining power of women and men in their household. It implies that the player having strong bargain power in real life will expect larger share from their partner and will propose less to their partner compared to those having lower bargaining power. Through this experiment we wanted to analyze that how market mediation in milk market affects the bargaining power of women in a household.

The game was played in two rounds, so that each player/participant had to play both the roles. To make sure that there was no interaction between participants, each participant was allotted different rooms/place by tossing a coin. In the first round , the participant who won the toss in room allotment played the role of a proposer (room- A) and participant who lost the toss played the part of a receiver (room-B). In the second round, roles were reversed and the participant in room-A played receiver and participant in room-B played proposer.

After participants entered into their allotted rooms, they were informed about their respective roles; the proposer or the receiver. Each participant was provided an envelope (blue envelope for men and pink for women), a paper (blue for men and pink for women), a pen, and Rs. 170 divided into 17 notes of Rs. 10each. As each couple had an incentive to earn extra Rs. 170 if they won the game, so their most likely choice could be to divide money into half/equally.But having

an odd number of Rs. 10 notes made sure that, in order to win the game, each player would think about the bargaining situations they encountered in their households and also what they expected from their partners regarding their bargaining situation before taking a decision.

Following that, in the first round, the proposer was asked to put in an envelope a sum equivalent to the amount of money s/he wanted to share with their partner and receiver was asked to write down on the given paper, theamount that s/he expected from their partner. The proposal and the expectation could be of any amount in between 0 and 170 in the multiples of 10 (10, 20, 30…170). In second round, the roles were reversed and the same task was repeated. After completing the game, envelopes and paper from each player were collected and amount contained in each envelope was recorded along with an expected amount on seperate columns of the survey form.

Couples whose proposed and expected amounts coincided were given an amount of Rs. 340 (Rs. 170 winning amount and Rs. 170 participating amount) and those who couldn't win were given Rs. 170 as a participating amount.

Bargaining Indices:

Using the results from above experiment, we created indices to calculate the bargaining power of spouses in their households.

Proposal Index for Women:

$$PIW = \frac{(HuPro - HuminPro)}{(HumaxPro - HuminPro)}$$

Where,

- Huminpro - Minimum amount proposed by husband
- HuPro - Husband proposal
- Humaxpro - Maximum amount proposed by husband

Expected Index for Women:

$$EIW = \frac{(WiEx - WiminEx)}{(WimaxEx - WiminEx)}$$

Where,

- WiEx - Wife's expectation
- WiminEx - Minimum amount expected by wife
- WimaxEx - Maximum amount expected by wife

Proposal Index for Men:

$$PIM = \frac{(WiPro - WiminPro)}{(WimaxPro - WiminPro)}$$

Where,

- Wiminpro - Minimum amount proposed by wife
- WiPro - Wife proposal
- Wimaxpro - Maximum amount proposed by Wife

Expected Index for Men:

$$EIM = \frac{(HuEx - HuminEx)}{(HumaxEx - HuminEx)}$$

Where,

- HuEx - Husband's expectation
- HuminEx – Minimum amount expected by husband
- HumaxEx - Maximum amount expected by husband

Women's Bargaining Index:

$$WBI = \frac{(PIW + EIW)}{2}$$

Men's Bargaining Index:

$$MBI = \frac{(PIM + EIM)}{2}$$

Women's Relative Bargaining Position:

$$WRBP = \frac{WBI}{MBI}$$

Where,

WRBP implies bargaining position of a woman relative to a man in a household. WRBP ranges from 0 to 1. Five situations arise from this range which is explained below:

- 0: This implies husbands are the financial dictator of household.
- 1: This implies wives are the financial dictator of household.
- 0.5: This implies equal bargaining position or equal sharing of resources.
- 0 to 0.5: This implies weak bargaining position for women.
- 0.5 to 1: This implies strong bargaining position for women.

5.5 Descriptive Statistics

Table 5.4 provides the summary statistics for all the key village level variables. Program villages have more landless households (87.118) than the control villages (45.5). Average irrigated land in treatment villages is 382.802 acres compared to 807.200 acres in control villages. Agricultural wage rates for males are significantly higher in treatment villages (Rs. 288.235) than the control villages (Rs. 245.00). Medical shops are available in 52% of program villages as compared to 10% in control villages. Significantly larger number of program villages had experienced floods in the past 12 months whereas significant numbers of control villages experienced draught in last 12 months.

Table 5. 4: Summary statistics for village characteristics

Outcome	Mean		T-tests	
Village Variables	Control	Treatement	t-stats	p-val
Male Population	1283.700	1231.824	0.133	0.895
Female Population	1281.000	1283.882	-0.007	0.994
No. of SC households	126.000	134.059	-0.182	0.857
No. of Hindu Households	438.500	423.118	0.117	0.908
No. of Muslim Households	42.000	21.706	0.966	0.343
No. of Kutcha Households	60.500	131.118	-1.308	0.203
No. of Semi-Pucca Household	317.200	192.118	1.302	0.205
No. of Pucca Household	62.300	47.471	0.409	0.686
No. of Households with functional toilets	227.700	150.471	0.838	0.410
No. of Households with Electricity Connection	439.400	402.118	0.269	0.790
Irrigated land in Village(in acres)	807.200	382.802	1.660	0.109
No. of Households mobilised into SHGs	158.200	121.647	0.589	0.561
No. of enterprises in Village in 2012	16.400	18.706	-0.376	0.710
Simpson's Diversity index for establishments in 2012	1.000	0.941	0.761	0.454
No. of enterprises in Village now	23.200	31.000	-0.823	0.418
No. of Households with BPL Card	304.200	356.688	-0.318	0.753
No. of Land owning households	426.000	318.529	1.011	0.322
No. of landless households	45.500	87.118	-1.084	0.289
No. of households engaged with fisheries	1.400	2.824	-0.806	0.428

Average Agricultural wage rate for males (in Rs./Day)	245.000	288.235	-2.904	0.008***
Average Agricultural wage rate for females (in Rs./Day)	305.000	314.706	-0.839	0.410
Average Non-Agricultural wage rate (skilled) for males (in Rs./Day)	420.000	497.059	-1.604	0.121
Average Non-Agricultural wage rate (unskilled) for males (in Rs./Day)	305.000	314.7059	-0.8388	0.4095
Average Non-Agricultural wage rate (unskilled)for females (in Rs./Day)	305.000	306.250	-0.079	0.937
Health Sub-Centre exists in Village	0.400	0.235	0.884	0.385
District Hospital/ Higher Medical Institution exists in Village	0.000	0.059	-0.761	0.454
Private Clinic/ Hospital exists in Village	0.000	0.059	-0.761	0.454
Medical Shop exists in Village	0.100	0.529	-2.377	0.025**
Primary School exists in Village	1.000	0.882	1.111	0.277
Upper Primary School exists in Village	0.600	0.647	-0.236	0.816
Secondary School exists in Village	0.200	0.235	-0.205	0.839
Higher Secondary School exists in Village	0.000	0.059	-0.761	0.454
Degree /Graduate/Post Graduate College/ University exists in Village	0.000	0.063	-0.784	0.440
Does village experience Drought in past 12 month	0.564	0.111	4.619	0.000***
Does village experience flood in past 12 month	0.051	0.265	-2.627	0.011**

Level of significance: *** p<0.01, ** p<0.05, * p<0.1

Table 5.5 provides information regarding household characteristics like household size, age of household head etc. for program (NDP-I) and control (Non-NDP-I) households. Women on an average are more educated in the program households (Approx. 4 years) than the control household (Approx. 3 years).

Table 5. 5: Household Characteristics:

Outcome	Mean		T-test	
	Control	**Program**	**t-stats**	**p-val**
Household Size	5.590	6.265	-1.185	0.239
Age of household head	52.275	54.519	-0.845	0.400
Highest class completed by household head	11.950	11.786	0.173	0.863
Household with male head	0.950	0.941	0.174	0.862
Total Women in household	2.725	3.057	1.009	0.315
No. of years spent in school by a woman	3.167	4.140	-1.680	0.094*

Level of significance: *** p<0.01, ** p<0.05, * p<0.1

5.6 Empirical Evidence

Table 5.6 represents the composition of assets holding and changes in it since 2012. Major assets taken in the study are dairy asset like milch animals, mechanized, non-mechanized, land, consumptive asset, & non-consumptive assets.

It can be inferred from Table 5.6 that since 2012, the holding of cross-breed cows in program households has increased to 0.432 but the holding has reduced for indigenous cows (-0.333). Although, rise in indigenous cows holding is 0.081 for control households but no changes are seen in the holding of cross-breed cows. There is a significant change in the holding of cross-breed female buffalo in the control households than in the program households (0.135 and 0.000). Program households have significantly more no. of non-mechanized assets in both periods, than the control households – today (4.000 versus 2.250) and 5 years ago (2.275 versus 2.275). Although program households have more mechanized assets in both periods, no significant changes in their holdings are observed. Number of consumptive assets like T.V, mobile, electric fan etc in 2012 (3.231 versus 1.475) and in 2019 (6.192 versus 4.500) is more for program households than the control households. But, changes in the consumptive asset between NDP-I and non NDP-I households are statistically insignificant.

Outcome	Mean		T-test	
	Control	**Program**	**t-stats**	**p-val**
Change in total no. of indigenous cows owned between 2012 and current year	0.081	-0.333	1.448	0.152
Change in total no. of Cross- breed cows owned between 2012 and current year	0.000	0.432	-1.855	0.067*
Change in total no. of Bullock owned between 2012 and current year	0.054	-0.054	0.548	0.585
Change in total no. of Indigineous Female buffalo owned between 2012 and current year	0.105	0.391	-0.976	0.332
Change in total no. of Cross-breed Female buffalo owned between 2012 and current year	0.135	0.000	1.961	0.054*
Change in total no. of male buffalo owned between 2012 and current year	0.081	0.079	0.023	0.982
Total mechanised asset owned now	0.000	0.154	-1.251	0.214
Total mechanised asset owned 5 years ago	0.000	0.038	-0.876	`
Total non- mechanised asset owned now	2.250	4.000	-5.428	0.000***
Total non- mechanised asset 5 years ago	2.275	4.115	-5.881	0.000***
Own Residential land	1.825	1.740	0.901	0.370
Total number of consumptive assets currently owned	4.500	6.192	-2.669	0.009***

Total number of consumptive assets owned in 2012	1.475	3.231	-3.123	0.002***
Change in total no. of consumptive assets between 2012 and current year	3.025	2.962	0.165	0.869

Level of significance: *** p<0.01, ** p<0.05, * p<0.1

Expenditure and consumption decisions of households are shown in the Table 5.7. On average control households (Rs. 3955.775) spends significantly more on the non-food items than the treatment households (Rs. 2487.308). Per capita monthly consumption expenditure is significantly more for the control households than the treatment households (Rs. 8710.790 and Rs. 5329.502 respectively). Also, Per capita expenditure on food consumption and non-consumption is higher in the control households (7885.325and 921.717 respectively) compared to treatment households (5194.147and 464.353 respectively).

Table 5.7: Expenditure and consumption

Outcome	Mean		T-test	
	Control	**Program**	**t-stats**	**p-val**
Monthly consumption expenditure (in Rs.)	44627.588	34415.111	1.436	0.154
Annual consumption expenditure (in Rs.)	550276	826589.4	-1.177	0.242
Total food consumption expenditure (in Rs.)	41077.813	34027.091	0.987	0.326
Total non-food consumption expenditure (in Rs.)	3955.775	2487.308	2.041	0.044**
Per capita Monthly consumption expenditure (in Rs.)	8710.790	5329.502	2.902	0.005***
Per capita Annual consumption expenditure (in Rs.)	107382.7	123294.9	-0.5462	0.5861

Per capita Total food consumption expenditure (in Rs.)	7885.325	5194.147	2.347	0.021**
Per capita Total non-food consumption expenditure (in Rs.)	921.717	464.353	1.974	0.052*
Amount spent on health events	2095.047	1390.076	1.202	0.230
	.118	.148	-0.2807	0.7803

Level of significance: *** p<0.01, ** p<0.05, * p<0.1

On an average, the households associated with DCS under NDP-I are earning significantly more from dairy than the control households. As inferred from Table 5.8, income from sale of milk is Rs. 14205.190 for program households as against Rs. 6961.538 for control households. Gross income is also more for the program households than the non-program households.

Table 5. 8: Income and Savings

Outcome	Mean		T-test	
	Control	**Program**	**t-stats**	**p-val**
Income earned from sale of milk in last 3 months (in Rs.)	6961.538	14205.190	-4.301	0.000***
Gross annual income (in Rs.)	176377.500	216811.923	-1.239	0.218
Annual Salaried Income	7230.769	19725.490	-1.295	0.199
Income from farm wage	7714.286	1500.000	1.472	0.147
Income from non-farm wage	40833.330	41717.950	-0.084	0.933
Percentage of saving from total income kept in Saving accounts	42.704	28.241	1.475	0.146
Percentage of saving from total income kept at home	11.262	17.872	-1.364	0.177

Level of significance: *** p<0.01, ** p<0.05, * p<0.1

Table 5.9 highlights the Loan and governance decisions of households in villages.. Adult members from 33% program households have attended gram sabha meetings in last 12 months as compared to 15% in the control households. Members from control households are significantly more likely to approach to their elected representative than the members from program households (57.5% and 35.7% respectively). Significantly larger number of control households than the program households have taken loan for the consumption expenditure (42.9% &5.3% respectively). Agriculture loan is taken more by the NDP-I households. This is rather a very encouraging trend wherein DCS members are more likely to access loans for productive purposes rather than consumptive compulsions.

Table 5. 9: Loan and governance

Outcome	Mean		T-test	
	Control	Program	t-stats	p-val
Number of Gram Sabha Meeting attended by hh members	0.071	0.146	-1.721	0.086*
Amount of Loan asked for (in Rs.)	33846.15	51263.16	-1.198	0.240
Amount of loan received (in Rs.)	32142.86	53157.89	-1.527	0.137
How long ago the loan was taken (in months)	13.533	41.417	-1.936	0.064*
Annual Rate of interest	34.556	32.953	0.154	0.879
Did any member of the household attend Gram Sabha meetings	0.150	0.329	-2.066	0.041**
Did any household member approached elected representative	0.575	0.357	2.247	0.027**
Was the loan taken from formal source?	0.643	0.421	1.252	0.220
Loan for agricultural purposes	0.071	0.368	-2.030	0.051*
Loan for medical purposes	0.286	0.316	-0.180	0.858
Livestock loan	0.143	0.053	0.874	0.389
Loan for consumption purposes	0.429	0.053	2.841	0.008***

Level of significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 5. 10: *Intra-household bargaining index*

Outcome	Mean		T-test	
	Control	Program	t-stats	p-val
Women Proposal	74.7787	78.9144	-0.8025	0.4230
Women Expectation	100.9292	78.4210	4.1444	0.0000***
Men Proposal	75.9292	84.2434	-1.6163	0.1072
Men Expectation	96.9469	84.5394	2.1908	0.0293**
WBI	0.5201	0.4784	1.9831	0.0484**
MBI	0.4875	0.4640	0.9768	0.3296
WRBP	0.5191	0.5166	0.1281	0.8981

Level of significance: *** p<0.01, ** p<0.05, * p<0.1

Table 5.10 gives the overall view of the intra-household bargaining game conducted in the 300 households. It can be seen from Fig 5.3 that there is a substantial difference in women's expected amount and men's expected amount in a game between program households (78.4210 and 84.5394 respectively) and control households (100.9292 and 96.9469 respectively). Although no difference is observed in the husband's bargaining index between program households and control households but women's bargaining index is significantly larger in the control households (0.5201) as compared to the program households (0.4784). This is presented in Fig 5.4.

Fig 5.5 shows that there is insignificant or miniscule difference in the women's relative bargaining power between the program and control households. In other words, although DCS establishment in a village has helped the households in increasing their income but has had a limited effect on women's intra-household bargaining position.
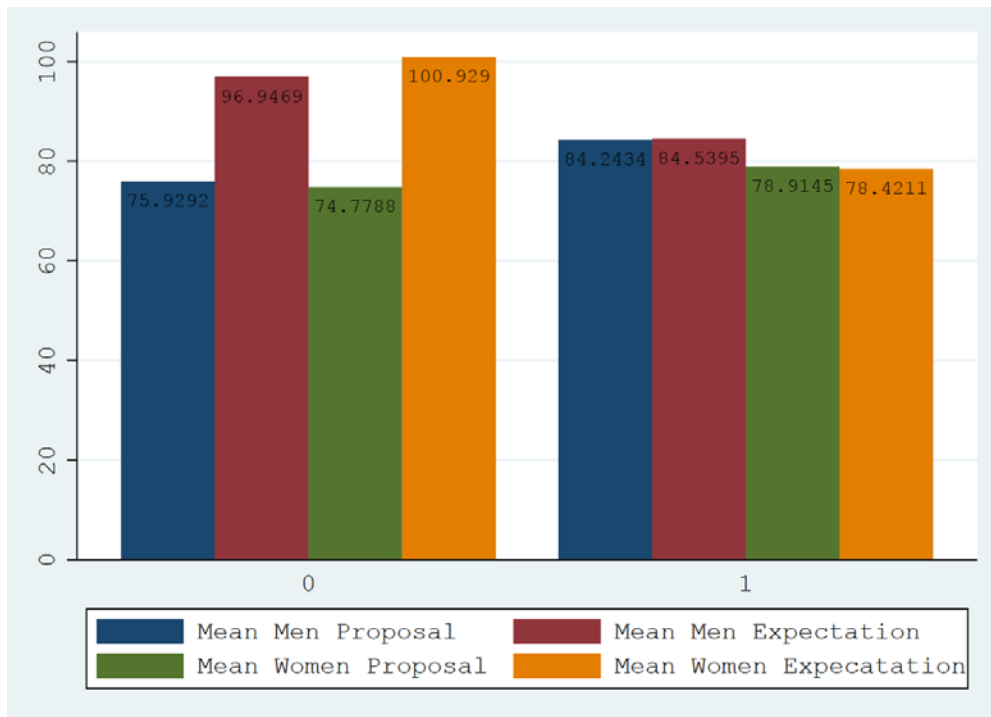
Fig 5 3: *Husband's and Wife's proposed mean expected amount in control and treatment households*
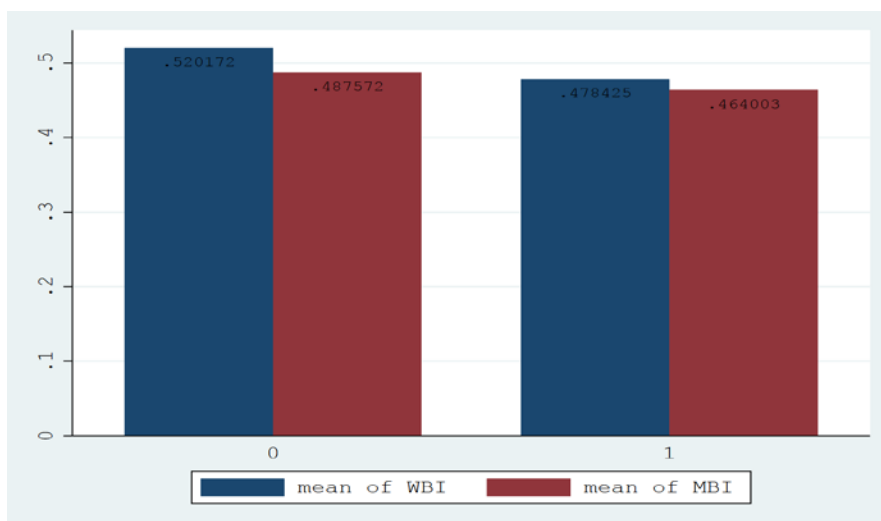

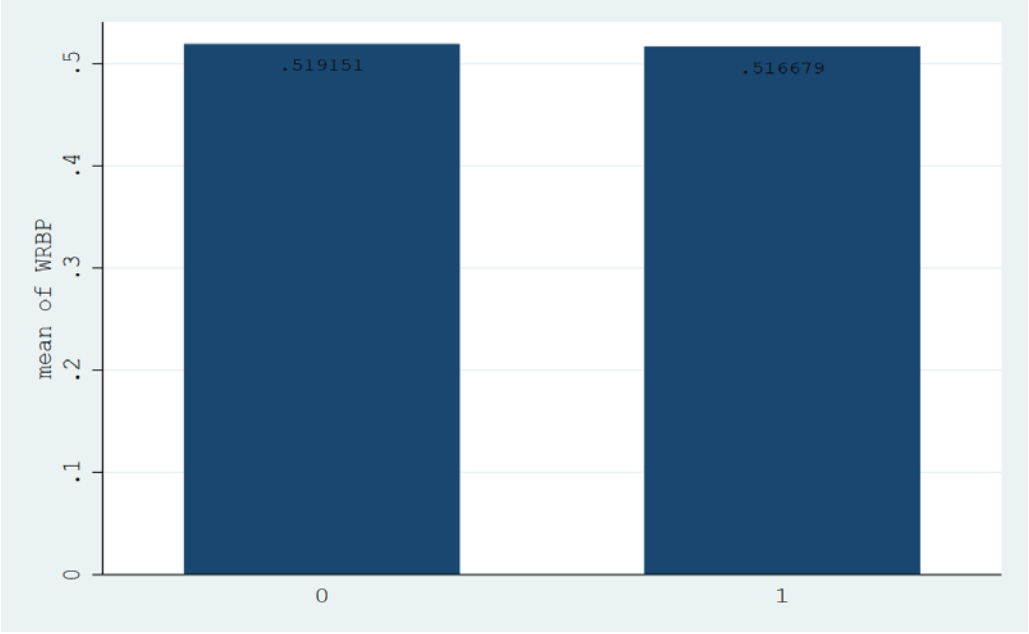*Fig 5 4*: *Husband's and Wife's bargaining indices in control and treatment households*

Fig 5 5: Women's average relative intra-household bargaining power in control and treatment households

6. Conclusion

Performance Evaluation and Sustainability analysis provided us the ranks of the DCSs which were evaluated. The top DCS have been mainly from the states of Punjab, Karnataka and Bihar. We see a similar trend in the inputs received by the DCS which be seen in the composite input scores received by the DCS. The better performing DCS would have higher probability of sustaining in the longer run. The DEA-AHP technique rationalizes the performance so as to look at the output per unit of weighted inputs applied by the DCS. Thus, if a DCS at an early stage utilized lower inputs but at the same time is able to give better outputs, has a higher chance of sustaining.

The analysis of inputs vis-à-vis the outputs by applying econometric analysis suggest that there is significant effect of DCS ability and physical-technical support primarily from the milk union over the performance of the DCS. Thus, physical and technical support from the milk union is helping DCS increase milk intensity and membership intensity which in turn will help the DCS sustain in the longer run. Secondly, the econometric analysis also suggests that when the index value is very high, it tends to lead to a counter-productive effect. Thus, at a policy level, there is a need to work on a support structure which is optimal. The effect of governance and management index, on performance, shows effect only after persistent efforts in making governance and management parameters work. Thus, a sustained effort on this parameter would give results in the longer run.

Case analysis presents a mixed picture: better prospects for sustainability of the newly formed DCSs under NDP-I and also the obstacles that present challenges for the DCSs to sustain their operations. *Sustainability of the DCSs should be seen using two different lenses: business sustainability and social sustainability*. Business sustainability is important for the DCS to maintain its operations, volume of milk collection and generate attractive profit. Social sustainability reflects its acceptance among the community as an institution that reflects social concerns as well as fabric of the community. However, it must not be mistaken that both types of sustainability are mutually exclusive, in fact both are inter-connected.

There is considerable scope for expanding the existing membership base. We have not found any special drive or efforts from the DCS management to increase the membership. Analysis also indicates an important role of non-members in maintaining the high or moderate, whatever the

case may be in specific DCS, level of milk procurement. However, DCS must strive to convert non-members into shareholders. While Economic sustainability may not get affected as non-member may keep on pouring milk in the DCS, the conversion of non-members into regular shareholder is necessary for the social sustainability of the DCS. This also reduces instability for DCS and it would have expanded membership base, hence ensured milk procurement.

The input support and market services provided by the Milk Union are instrumental in saving the DCS members from the market and other economic shocks. Almost all the DCSs are using these supports. However, DCSs have a long way to go in strengthening its own support to be given to local community, not specifically to its members. Critical linkages between the DCS and Milk union are crucial in providing economic insurance to DCS members. The analysis also reflects that DCSs are far behind in acquiring necessary assets require for the smooth operations. DCSs also lack example of local innovation and use of technology in their operations. The support from Milk Union and other public bodies are required in this regard.
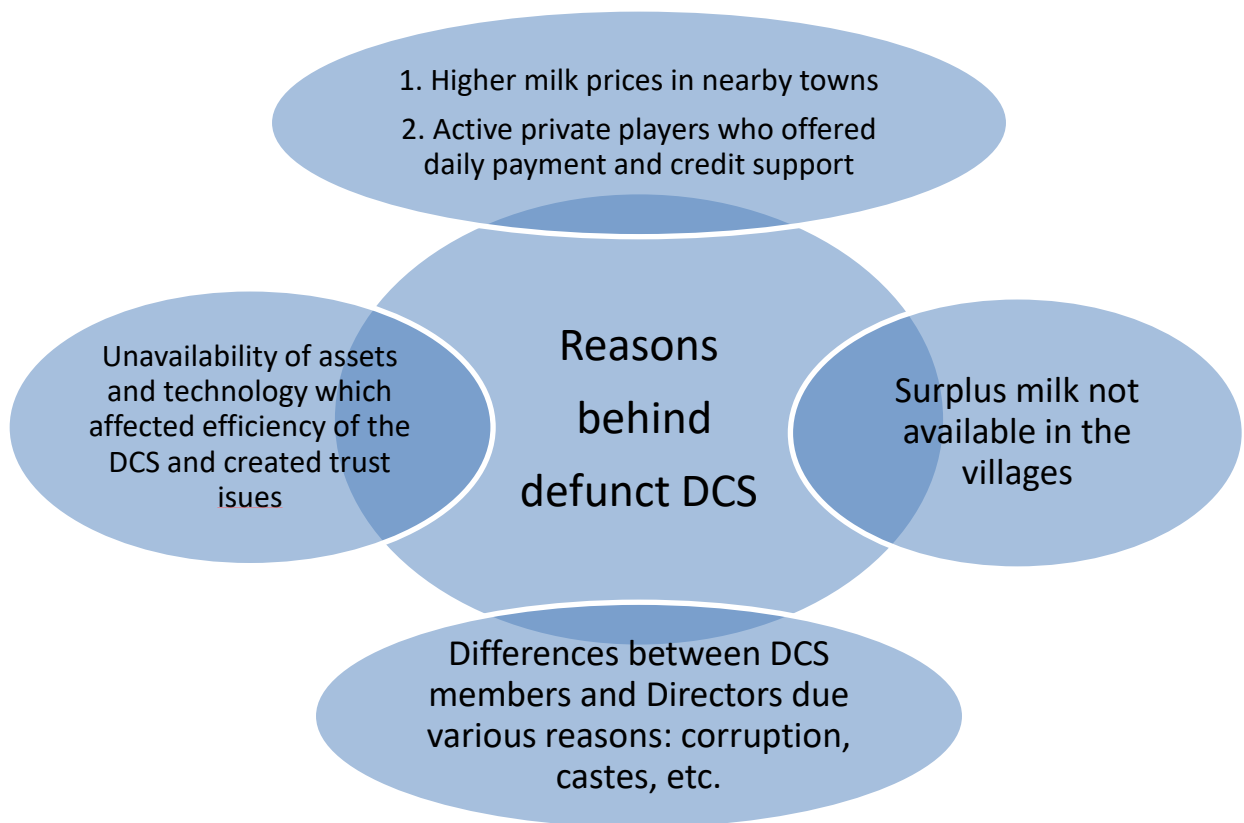
1. Higher milk prices in nearby towns
2. Active private players who offered daily payment and credit support

Reasons behind defunct DCS

Unavailability of assets and technology which affected efficiency of the DCS and created trust isues

Surplus milk not available in the villages

Differences between DCS members and Directors due various reasons: corruption, castes, etc.
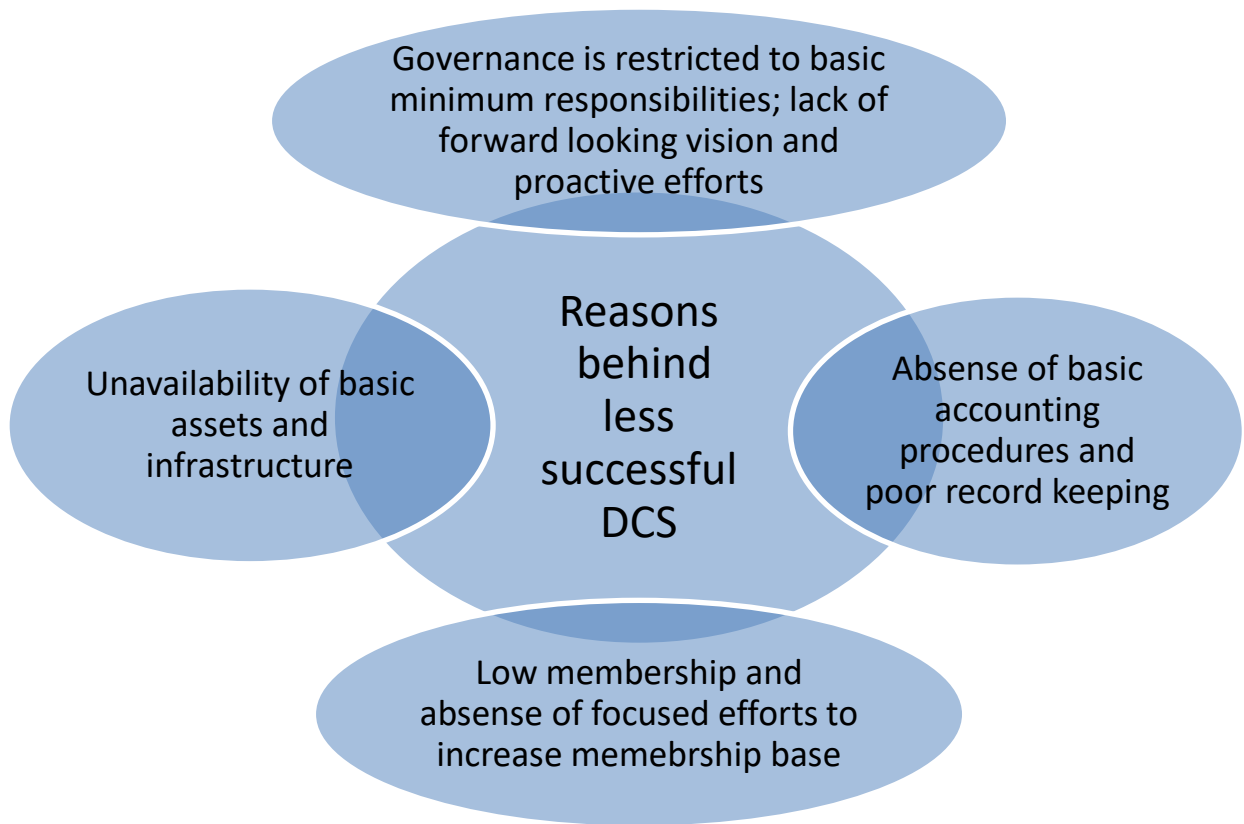
Fig 6. 1: Reasons behind defunct DCS

Fig 6. 2: Reasons behind less successful DCS

Lastly, the perspective and outlook of governance of the DCSs needs to be broadened. While the governing bodies of the DCS are performing minimal task necessary to run the DCS, these governance structures have to now broaden its horizon and must envision how to take the DCS beyond minimum necessary operations. They must explore ways for the meaningful engagement of the DCS with the local milk economy as well as society with the perspective of empowerment of milk farmers.

There is considerable synergy between the econometric analyses, which is confirmed by the case-study analysis. Hence, there is conformity of the quantitative study with the qualitative study on major discussions.

Following are the suggestions to improve sustainability prospects of the DCS:

1. Membership base should be expanded. DCSs, with the help of Milk Union, can organize special drives every six month or once in a year to increase the membership.

2. DCS must devise strategies to incorporate non-members into its existing membership base. It is not necessary that every DCS have same set of strategies in this regard. Milk Union may encourage DCSs to come forward with their own strategies and help them implement the same.

3. District Milk Unions may develop a performance based incentive structure, beyond profit, for those DCSs' who champion in expanding the membership base.

4. DCS must focus on developing basic infrastructure and acquire minimum assets in order to run their operations smoothly. (As pointed out in the study; the basic facilities such as automated system for fat calculation does not exists in most of the DCS)

5. Milk Union Administration should keep a close watch on the DCS that have not been able to perform better and their operations have deteriorated consistently. For example, Milk Union can ensure that every DCS has completed audit of its business and documentation is up-to-date. Trouble shooting efforts can be initiated in the cases where DCSs are not responding to such calls from the Milk Union.

6. Milk Union (or NDDB) can work out a sustainability benchmarking framework for the DCSs and carry out an internal analysis for every DCS from time to time to see if the DCS is becoming viable and moving towards achieving sustainability.

7. There should sustained efforts to improve governance in DCSs even though in the early stages of the DCS development, the results might seem counter-productive. It would show positive results in the longer run. Thus, the DCS board members should be trained and facilitated to develop leadership and have proper governance structures.

8. The leadership of the DCS should be selected based on its vision for the DCS. It should be such that strives to achieve maximum within the tenure of the governing body. Even though governing body is elected unanimously, such vision statements/presentations can be provided by the aspirants of the governing body to DCS members.

The result from the impact evaluation of NDP-I on the welfare of the dairy farmer's households implies that the connection with the dairy cooperative societies has helped them in increasing their dairy income significantly to control households and as a result of this, the household's total income has also increased. Also, it can be noticed that NDP I households are less likely to take outside help for fulfilling their consumption expenditure as compared to its counterpart households in the control villages. Animal composition has significant changes in the program

households. Households associated with dairy cooperative have shifted their rearing preference from indigenous cows to cross-breed cows for more productivity.

Although no impact has been observed on the women's intra-household bargaining power but it can be inferred from the experiment that men associated with dairy farming are more likely to include their women in household financial responsibility.

The limitations of the study are as follows: Access to financial data was limited as many of the DCS were in their early stages of development and they did not have effective systems of maintaining records. The study could not take comparison groups as the formation of new DCS has been done in the recent times under NDP I. Therefore, we could not get comparable DCS which were formed beyond the purview of NDP I. There were challenges in collecting the data for defunct DCS as there was no structure in place and there exist conflict between ex-members.

Annexure- I: Detailed Case Study Analysis

Case Study on Modahalli Dairy Cooperative Society

Introduction

Modahalli village is situated in Kollegal Taluka of Chamrajanagar district of Karnataka. This region falls under the Mysore division. This village is located about 42 km from the district headquarters. The total population of the village is about 350 persons residing in about 45 households. The literacy rate of the village is about 50 percent. The female population of the village, as per the census 2011, is approximately 49 percent, which is much more than the national average.

Modahalli DCS was established in July 2013 under NDP-I. The DCS procures about 350 liters per day in lean season (during summer). In the peak season (rainy season) daily milk collection of the DCS rises up to 500-600 liters. The DCS has a total of 77 members (shareholders), including 30 women members. The current proportion of women DCS members (26 percent) is below the target set under NDP – I. Initially the NDP aimed at maintaining 33 percent women members in new DCS, but later it was revised to 50 percent.

Operation

At the time of case study (March 2019), this DCS was able to procure an average of 350 liters milk every day. A total of 22 people (15 non-members + 7 members), including 4 women. Since there is no fat machine available in the DCS, DCS calculates the rate on the basis of average fat of 3.5. This results into the complaints raised by the milk pourers with regard to milk quality. The members often claim that their milk is of high quality, but because of lack of appropriate technology and infrastructure, they are not getting correct rates for the milk they sell to DCS. DCS does not have basic infrastructure which now a days most of the DCSs have, which include - automatic fat testing mechanism, computers, etc. One major reason behind unavailability of basic infrastructure is the threat of robbery, since DCS does not have secure building/place to keep its assets. DCS pays to milk pourers once in 15 days. Not all DCS members have bank

account. Therefore, DCS pays in cash. DCS members also prefer paying in cash as it saves their time which they would have spent on visiting a bank and withdrawing money.

Since the DCS does not have basic infrastructure, DCS Secretary finds very difficult to manage the daily operations. He has to travel 5-6 km every day from his residence to milk collection point. Fragmented structure of the DCS (no proper place available for milk collection as the milk collection point is very far from populated habitats, not enough infrastructure, etc.) imposes a barrier for the DCS to progress. The DCS has only one staff, i.e. Secretary. Since fat testing is not done, the need of Tester does not arise.

Governance and Management

DCS does not have proper infrastructure. DCS management has rented a thatched structure, a roadside site on an agriculture field. DCS does not have any assets except a few canes and chairs. DCS Secretary informed that they cannot keep any assets because of possibility of theft. This site is very far from any habitation. The DCS is governed by a governing body (or Board of Directors) consisting of 12 members (or directors). Out of the 12 directors, 10 directors are male while only 2are female. Caste-wise composition is as follows: 9 general, 2 OBC, and 1 SC. The governing body is also mix of small and medium milk farmers. The governing body was selected through consensus. No election took place. Secretary has gone through the mandatory training which is required to operate the DCS. However directors are yet to recieve any kind of trainings.

The number of DCS members who participated in the last two general body meetings, which takes place annually, is 21 and 22 respectively. The major agenda during these two meetings were: presenting audit report, discussion on annual profit that DCS makes, approving budget to cover the operational cost of the DCS, appointing auditor for the auditing of DCS finances next year, and issues related to quality of milk. Discussion also took place about the concern of DCS members regarding the quality of milk and how to improve it.

Support Provided by DCS to its Members

DCS does not provide any specific support its members on itself. However District Milk Union provides regular supports to DCS members. This support includes: mineral mixture on

subsidized rates, cattle feed, artificial insemination services, veterinary services, etc. However, since there is no proper place to store the material and people live very far from milk collection point, the consumption of mineral mixture and cattle feed is thus very low. DCS do not offer any advance payment to milk pourers. DCS through District Milk Union also facilitates insurance for its members of the age group between 18-70 years. Members pay INR 306 per year and the District Milk Union contributes an equal amount. If any member or non-member who has been pouring milk actively dies, the District Milk Union also provides a sum of INR 15000 to the family of the deceased.

Future Challenges

Modahalli DCS mostly caters to people living in their farmhouses between Kamgere and Laxmipura villages. People from surrounding areas, some of them are also DCS members, have bought farmhouses in Modahalli and they keep milch animals in these farmhouses. This restricts the expansion of DCS's membership. Milk farmers from nearby places go to either Laxmipura DCS or Kamgere DCS to sell the milk. This puts restriction on the expansion of the DCS membership. This could be a serious threat to DCS operation if existing members decide to move to other place or not to keep milch animals.

Secondly, milk pourers more often object about the DCS's decision to pay everyone on the basis of average fat of 3.5 percent. This is not a viable practice for both the DCS as well as the milk farmers. This practice discourages those milk farmers who work hard to produce quality milk. On the other hand, DCS might be bearing loss for those farmers whose milk is not of a minimum quality. This practice may also encourage people to mix water in the milk as the quality of milk (fat) is not measured.

Conclusion

The idea of having a DCS in this area came up because of people living in their farmhouses did not have any nearby DCS to pour their milk. DCS has been able to maintain relatively higher milk procurement among the new DCS established under NDP-I. However, this achievement may diminish if current milk pourers decide not to rear milch animals. DCS does not have prospects to expand its business as it does not cater to a big population.

Case Study on Ganganadoddi Dairy Cooperative Society

Introduction

Ganganadoddi village is a small village in Kollegal Taluka of Chamrajanagar District of Karnataka. The village is part of Suleri Palya Gram Panchayat and is located about 38 km from Kollegal and about 100 km from Mysore city. Total number of households in the village is about 80 and the population of the village is about 520. The village has about 66 percent Scheduled Caste population. The total area of the village is 365 hectares, out of which about 55 hectare is non-agriculture land. Total irrigated area is about 130 hectares. Village does not have many milch animals. Our survey indicates that there are only 10 milch animals in the village. Ganganadoddi DCS was established in July 2014. This is an all-woman DCS which means all the members of the society will be women. The objective behind the establishment of this DCS was that having DCS in the village will encourage women farmers to rear milch animals, which may become a source of income for the women.

Operations

There are 40 members in the DCS. However, the number of active members (those who are currently pouring milk) is only 8 and total average milk procurement is only 47 liters. The current procurement is very low. Not everyone in the village pours milk in this DCS. DCS staff told that some people even go to other nearby DCS to pour their milk. They are not happy about the functioning of Ganganadoddi DCS and do not pour milk in the DCS. Another reason behind the low procurement is that there are not many milch animals (only about 10) in the village. Als, no non-members pour milk in the DCS. This may be because very few people in the village have milch animals.

Governance and Management

The DCS is run by a nine-member Board of Directors selected by the members unanimously. There is woman Secretary from the village, who looks after day to day operations. The records in the DCS are poorly maintained. Share ledger is not maintained. Payment book is also not maintained properly. The DCS has only one audit report for the initial year. No audit has been

done for later years. The office bearers of the district milk union shared that DCS has not provided any documents to the auditors to carry out audits. The DCS has not convened even a single general body meeting from the inception. We also did not find any trace of monthly meetings of the Board of Directors. No records of any meetings have been maintained.

Unlike other DCSs in the region, this DCS is making monthly payment to its members. The payment is made in cash on the basis of average fat of 3.5. DCS does not keep proper documentation of payment made to milk pourers. It was quite surprising to observe that DCS was paying only INR 22 per liter to the pourers against actual cost of INR 23.50. The difference is kept by the DCS. Since DCS is not able to increase the volume of its milk collection and milk quality is low, DCS does not have enough resources to pay for the salary of the Secretary. The DCS Secretary keeps this money (difference if INR 1.5 per liter) in lieu of her salary.

Support to DCS Members

The support and benefits that are being provided by the Milk Union through the DCS are not reaching the members. The DCS does not provide any mineral mixture and cattle feed to its members. Active DCS members rarely send request to receive vet or AI services. No member or milch animal is covered by an insurance which is the case with many DCS in the same Milk Union.

Future Challenges and Conclusion

It was observed that Milk Union has not intervened effectively even after several serious lapses, such as no auditing of the DCS finances, which is one of the mandatory requirements to run a cooperative society. Milk Union staff makes a visit here only once in 3-4 months while generally this visit is made at least once in a month. Milk union staff also informed that Secretary does not attend any meetings called by the Milk Union to take stock of the situation. Milk Union has to decide the fate of the DCS as it is not adhering to necessary legal requirements, milk collection is very low, no support is extended to its members, and internal governance is almost absent.

Members are not being paid actual amount for the milk they sell to DCS. This also leads to unethical practices on part of the DCS Secretary. The DCS is facing daunting challenges in terms

of its survival. The intervention from the Milk Union is imminent to decide if the DCS should be allowed to function or not. If it is allowed to function, substantial changes need to be brought, including major changes in the leadership, in order to regain members' confidence.

Case Study on Chamtha Mahila Dairy Cooperative Society

Introduction:

Chamtha Mahila, women dairy cooperative society formed under NDP – I started its operation from December, 2016 under the supervision of D.R. milk union, Bauroni. The distance of the DCS from milk union (also Barauni happens to be the nearest city) is around 30 km and it comes under the Bechwara block. This village is majorly populated by Yadavs and other OBCs and few communities of schedule caste also reside in the village. There are a total of 200 households (HHs), comprising a total population of 800 persons, of which 425 are males and 375 females. Out of 200 HHs, 110 are involved into dairy farming. Most of the dairy HHs are having less than five milch animals. The composition of milch animals in the village is 60 percent buffaloes and 40 percent cows.

Operation:

Currently, ChamthaMahila has 74 members out of which 40 are active. It also accepts milk from the non-members. Formation of dairy cooperative goes through two steps: first, preliminary survey is conducted by the union to reckon if village has enough milk to sell after village consumption. Second, a gram sabha is organized for the awareness and education of milk farmers about the latest development and techniques in milk farming, benefits of being a part dairy cooperative, selection of secretary, formation of board and selection of board members through consensus. In gram sabha, all dairy farmers who willingly want to be a member of the Dairy Copperative Society (DCS) are asked to purchase one share of Rs. 10 with membership fee of Rs. 1. A farmer needs to pour milk for at least three months in a year to remain an active member of the DCS.On an average, the DCS collects 1100 litres of milk per day and it collects milk twice a day. The members receive an yearly bonus from district milk union and also DCS profit is distributed proportionately among its members after deduction of all the cost incurred over the operations of DCS and salary of secretary and staff. This DCS earns in two ways: first, DCS is given five percent commission on the sale of cattle feed, mineral and mixture; and second, the earning from the sale of milk collected for testing is given to the dairy.

At the time of inception, this DCS was given 4 cans, milk testing equipment, stationery, and other basic infrastructure. It started its operations from the residential premises of the secretary and is still running operations through that setup. After continuous outstanding performance, the DCS was given an automatic milk collection unit (AMCU) for better functioning. Additionally, the Union has provided one month training to the secretary for executing daily tasks related to DCS, she was given training for animal management and dietary management as well. The primary activity of the secretary is to ensure smooth operations of DCS in terms of collection of milk, milk testing, management of financial assets etc. Secondary activity is to help farmers in dairy management, disseminating knowledge about latest diary techniques and sharing of important information given by the milk union and implementation of schemes of state or central governments.

During our discussion, we were informed by the Secretary that the DCS started with very few members as it was facing strong competition from a private cream making company but as result of continuous efforts and various awareness programs implemented by the milk union, the DCS was successful in expanding its membership base. The closure of the private cream company proved to be an added benefit for the increased milk procurement. Monitoring or regular visit of route supervisor and other staff from milk union also helped the DCS function well and increase the level of satisfaction of pourers about scrupulous operation of DCS.

Governance and Management:

The current committee comprises of 11 members. Out of 11 members, two come from schedule caste and nine come from other castes in the village. One of the committee members is also a part of the panchayat while most of the other committee members are connected with the self help groups (SHG). Board or committee seems to be the ideal representation of milk farmers. Of the 11 committee members, 8 members have less than 5 milch animals. In the initial phase, all the committee members were given training in the union. Incumbent committee was formed during the inception of DCS and committee members were selected through consensus during the gram sabha. First election in the DCS will be held after the completion of 5 year tenure of the current committee. During the course of discussion with the chairman and other committee members, it was learnt that till now only one *aamsabha* (annual general meeting) has been held. The first *aamsabha* was mainly focused on enhancing productivity of milch animals through

awareness among farmers about better hygiene, vaccination, providing artificial insemination (AI) services through trained AI worker provided by the union, and improving diet of the animals. Other objective was to increase membership by persuading and taking membership fees from those farmers who may qualify to become a member. Members also expressed their concern about the low price for their milk and questioned the secretary regarding their milk not being tested regularly. Two solutions were drawn out in this meeting. First, increasing the productivity of milch animals by imbibing all the latest dairy farming techniques with the help of DCS and the second solution was to ask for AMCU from milk union for regular testing. After this, the farmers have been content the milk is tested on a routine basis for which a slip having weight and rate of the milk is provided the members instantly

The monthly meeting of the committee members is held regularly, where they discuss about the problems arising over routine operational issues of the DCS, work upon the complaint or problems received from members, assess the expenditures and earnings of the DCS, and provide approval for the suggestion implementation or expenditure made by the secretary for the expansion of the DCS.

Demand for milk in Bihar can be categorized in two parts – *high-season* and *non-season*. During marriage season or festivals like Dusshera, Diwali, chat puja –the demand for milk is very high. This is referred to as the high season. This is the time when even the private competitors become very active. During this period pourers usually sell their milk to the private players in lure of some extra money and the union falls short of milk. The non-season is when the demand of milk is low and private players refuse to buy milk from farmers. During this period, milk supply increases more than the capacity of the milk union. To tackle this problem, union started penalizing those farmers who were not loyal with the cooperative during high season. Union made a rule that it would accept the same amount of milk from the farmer in both the seasons. If the quantity of milk poured in non-season is higher than that during the high season, the farmer is penalized at the rate of Rs. 5 per litre.

This step by the milk union was very discouraging for the farmers to continue to pour in the DCS. To resolve this challenge, governing body including the secretary came up with the solution that they would not accept milk from non-members but would continue to take it from the members to maintain the membership of the DCS.

Support to DCS members:

Apart from the price of the milk and the bonus from the union and the DCS, a sum of Rs. 25000 is provided as help to the family in case of natural death of any of the member and also Rs. 1.5 lakh of accidental insurance cover is provided by the union. Union has started to incentivize its regular members - it provides an extra Rs 5 per litre to those who pour the same or more amount of milk in the high season than the low season. Union also provides advance payment during festive season on demand from DCS.

At the DCS level, advance payment is given to members in need and it provides certificates to members for the application of loan from banks. If in some month, payment gets delayed from the union, the DCS provides mineral mixture etc. on credit to the members' which is later adjusted against their payments. AI and veterinary services are also made available to the farmers on payment of the required fees to the DCS. On request, the DCS also helps to arrange milk and milk products from the milk union for their members on credit for social functions too.

Payment cycle at the DCS is thrice a month or every 10 days. Payment is made in cash. DCS tried to pay famers directly into their bank accounts but farmers refused to take the same, citing a reason that they have to forego one day's labor in order to withdraw money from the bank.

Before the establishment of Chamtha DCS, farmers used to go to another DCS which is located 3 kms far from their village. On speaking to some of the farmers, they seemed fairly satisfied with the DCS and the working of the DCS as there is no discrimination between large milk farmers and small milk farmers which they had earlier experienced from private players. Furthermore, DCS staff is very humble and easy to approach for even miniscule problems. Most importantly, members trust their governing body.

Innovation & technology, future prospects and challenges:

At the union level, a seed plant is proposed to start very soon. This will help farmers in two ways: first they will get seeds for green fodder at lower cost and second, dairy farmers will be selected for growing seeds on their land to earn money by selling seeds to the union. The Union also comes with different programs such as celebration of "*mahiladiwas*" and other saluting & learning events to encourage their DCS and milk farmers to perform better.

As the dairy is running at secretary's home, now the DCS aspires to have their own operational building for which secretary has already transferred land on the name of dairy cooperative society. Currently, it has given application to milk union to fund the construction of building.

Unbalancing between high and low season is posing greatest challenge to the DCS. To counter this problem, union needs to increase its sales by using its marketing infrastructure or strengthening their marketing mechanism.

Conclusion:

High efforts from both, the milk union and DCS are making it successful in fulfilling the objectives of NDP-I, viz. increasing the production of milk and increasing the productivity of milch animals. On questioning the milk union about the success of their diary cooperatives, it was explained that the share goes directly to the competition within the farmers and also among the villages to perform and earn better than their counterparts. A lot more can be achieved through strengthening other untouched or weak part of the Indian milk sector.

Case Study on Emadpur Mahila Dairy Cooperative Society

Introduction:

Emadpur Mahila dairy cooperative society, a women run DCS, is working since January, 2017 and it was established under NDP – I with the help of district milk union, namely, D.R. Bauroni milk union. Population of Emadpur village is around 500 with parity in sex ratio. It has OBCs and schedule caste community living with equal population of Muslims. In terms of connectivity, it is located 8 km away from Garpura block and 35 km from Begusarai district. Also, the nearest sub-health centre is 1.5 km from the village and nearest health centre is situated at block level. In Emadpur village, there are 75 houses out of which 7 are pucca houses, 27 semi-pucca, while 35 families live in kachha houses. Most of the households in Emadpur village are involved in dairy farming and are having less than 5 milch animals.

Operation:

DCS was started with 38 members pouring around 18 litres per day. Now, it has reached to 49 members and on an average DCS collects 85 litres per day from 15s member and 9 non-members. The farmers who pour milk for 3 months in a year or pour more than 500 litres annually, become eligible for the membership. So, by purchasing one cooperative share worth Rs. 10 and paying 1 rupee membership fee, a farmer becomes a permanent or life member in their dairy cooperative society. Emadpur DCS was proposed under VBMPS on the basis of preliminary survey to assess the capacity of village in milk production. It was then formed after the gram panchayat in which all the dairy farmers were called to inform them about the process to become a member in DCS and the benefits of pouring milk in the DCS. A committee was also formed by selecting members through consensus among farmers, and the secretarywas nominated by the milk union on the basis of criteria defined to become secretary. Through short films, milk union had educated farmers about the latest dairy farming techniques and also made them aware about the dairy farming business at large.

At the opening of DCS, it was provided with 4 cans, traditional milk test set containing centrifugal machine, stationery, and some rate charts. Emadpur dairy is run by a secretary who is an HSC holder while it functionsfrom a room given in the house of the secretary. Secretary was sent for 24 days of training to the training centre in Patna, where she was taught about the dairy

farming techniques by qualified trainers using practical illustration. She was also given training for daily operation of DCS such as milk testing, fund management, file management, and other functions of DCS.

On discussion with the secretary, we were informed about the competition they are facing with the private players who provide large advance payments to the milk farmers. To counter this challenge, DCS has started monthly awareness program with the help of route supervisor and other senior staff of milk union under which they visit the farmers and tell them about the benefits of becoming members. To attract members, regular payment on the basis of the quality of milk, bonus, price difference, small advance payment to those in needs (from DCS end) are provided. Also Rs. 25000 is given as a support in case of natural death of the member, and all the dairy members are insured in a group insurance with sum assured of 1.5 lakhs for accidental death. Non-members are given all the above benefits except for bonus, insurance and natural death help fund. In physical support all the pourers are provided with *sudhadana* (fodder), mineral mixture, seeds from the DCS at cost price from milk union without charging the transportation cost. Regular monthly meetings are held by the DCS in which staff from union comes to help the secretary and try to understand the problems which the pourers mayface at the DCS level and also provide solutions for them.

Apart from above benefits, union pays incentive of Rs. 5 per litre, to those who maintain its milk in both flush and lean season. Usually, DCS makes payment in 10 days and all its payment is made in cash but sometimes when the payment is delayed from the union, DCS pays the farmers from the DCS funds. DCS has also provided training to selected members of the dairy cooperative to train them in advance milk farming skills and to disseminate knowledge at the village level through them. DCS has helped farmers in buying fodder cutting machine at subsidized rates from the district milk union. During our conversation with DCS members, it was learnt that they have got a regular and stable source of income. Before the DCS was formed, they were selling their milk to private players within the village. The price they used to get was very low but since the establishment of DCS, they have the choice to either pay farmers competitive price in line with DCS or to shut down their middle men job. Furthermore members seemed happy with the cordial nature of the DCS staff and were completely satisfied with their performance.

Governance and management:

The current committee is the first committee which was formed during the gram sabha at the time of its inception. It comprises of 13 members out of which two members belong to schedule caste and the remaining 11 represent rest of the castes or religion in the village. It has also been observed that all the members of the committee are involved with self help groups (SHG) or jeevika where they are involved into saving and managing fund and having interactions with financial institutions which are all helping them in managing the work of the DCS. They have also received training from the milk union in terms of managing the DCS and also to monitor the work of the secretary.

We were informed by the committee about the issues faced by farmers at the DCS level such as non-transparency and problems related to delay in payments. As the testing doesn't happen in front of them, most of the farmers get the same price for different quality of milk, and currently payment is also delayed.

The first annual general meeting will be held very soon and they have already decided their agenda on which the discussion will be done. For price issue, committee members have already directed the secretary to apply for DPMCU from milk union and milk union has given a positive response to this demand. So, price aberration of milk will be resolved in the near future. The second agenda or topic of discussion will be addressed on the transfer of payment to milk farmers directly into their bank accounts as this would avoide ambiguity in the work of the DCS. For this purpose, the members have asked for help from milk union and bank manager in order to open accounts for milk farmers in the same Grameen Bank in which DCS has an account. There is also a discussion between committee, secretary, and milk union to start silage production within the village. One of the committee member has even agreed to start silage making on her personal land.

Future prospects and challenges:

Currently the greatest challenge for the DCS is to maintain its membership as due to its limites capacity, the union has imposed a penalty of Rs. 5 per litre on excess milk collected during the lean season as compared to the flush season when farmers prefer to sell milk to private players in lieu of extra money. To resolve this problem, DCS has decided not to put this burden on any

particular member or non-member by chosing to apportion on everyone by shutting down milk collection for one or two days whenever milk collection exceeds from its limit.

Another problem faced by the milk farmersis the late payment from milk union since last two months. As most of the villagers who are engaged in dairy farming are predominantly poor and marginal agriculture farmers, dairy is their major source of income. Their daily household expenditure depends on the income they receive from dairy. Late payment affects their consumption level. To palliate the situation, th dairy is distributing advance payment to those farmers who require money to meet their end needs.

DCSs future objectives can be comprised of two parts: short term or near future and long term. In short term, firstly, the DCS has decided to shift from traditional milk testing machine to DPMCU for which they have already requested to the milk union. Secondly, they are planning to make payments directly in the bank accounts of their members. Thirdly, they soon propose to start silage production within their village, which will not only help them in increasing or maintaining milk productivity of milch animals in the lean season but also to increase the income prospects of those famers who will be involved in this process. In long term, DCS aspires to have its own building from where it can operate;, for this DCS has approached the panchayat to allocate some land on the name of the DCS.

Conclusion:

Continuous support from milk union and high efforts made by the DCS are helping them to increase both its membership and milk collection. Although, a lot can be improved in terms of efficiency of the governing body but regular scrutiny from milk union and innovative methods made by the DCS to tackle daily challenges in operating the cooperative is helping DCS to ascend their output.

Case Study on Sarokh Dairy Cooperative Society

Introduction:

This case study will depict how a dairy cooperative society which was thriving initially went into doom. Sarokh dairy cooperative society was started in 2015 with the help of Bhagalpur milk union. Sarokh DCS was established in a flood prone area. Generally, this village is inundated under water for two months in a year,. The population of Sarokh is around 850 persons out of which male add up to 440 and female around 410. The entire population comprises of OBCs. DCS is located 15 km away from the Shahkund block and 17 Km away from Bhagalpur district.

Operation:

When Sarokh DCS was formed, it was started with only 20 members. These 20 members were identified by milk union in the gram sabha. Process of DCS selection was exercised in two phases by the milk union. In the first phase, they had a preliminary survey to know if Sarokh had enough surplus milk after their personal consumption and in second phase they reckoned if the surplus milk was enough for the milk union to be viable to send the milk truck to the village. Once the village was identified over viability criteria, milk union had organized a gram sabha with the help of the panchayat to take the consensus of the villagers if they were willing to establish a DCS in their village. After a consensus was reached, committee members were selected according to the rule made by the Bihar Milk Co-operative Federation Ltd. (COMFED). Following this the committee members, through consensus, nominated a secretary, keeping in view the rules implied by the COMFED.

Secretary of Sarokh is a graduate and comes from a humble family background. He had been working competently for which he was also awarded by the COMFED.

At the inception of DCS, it was given all the necessary help which was required for running the DCS and was available under the NDP – I scheme such as two cans, traditional milk testing unit, stationery, some flex mentioning the rates of milk according to fat and SNF in the milk. Furthermore, secretary was sent for 26 days of training at the training centre where he was given training for operating DCS smoothly, such as testing milk, maintaining files, managing funds etc. Beside this, he was also introduced with the latest dairy techniques and was trained on some interpersonal skills for disseminating knowledge with milk farmers and smoothly conducting

DCS operations. Route supervisor also visited once a month for monitoring the progress. Currently, DCS does not have any definite place for its operation and is running its operations at the veranda of one of the committee member's house.

Sarokh was started with 20 members and milk collection was around 25 litres per day. With continuous effort of secretary and committee it increased its strength to 40 members in one year with average milk collection around 60 litres per day. Secretary also requested for the local resource person (LRP) to educate milk farmers about the diet management for the milch animals to increase their productivity.

But currently the situation seems very depressing at this DCS as membership has fallen down to one and milk collection to 10 litre per day. This milk is coming from one of the committee members and he is trying hard to save the DCS from becoming defunct. Now, most of the farmers whosoever are engaged in milk farming are selling it outside to the private players even at lower rates than the price paid by the milk union.

There are two main reasons for failure of this DCS: first, late payment from milk union and second, severe floods resulting in the death of many milch animals In the initial phase when payment was on time, DCS was thriving both in terms of membership and milk collection. The efforts made by the old as well as the new DCS formed under NDP – I have increased both the production and productivity without increasing the capacity of milk union. Limited resources available with the milk union to process, and weak marketing mechanism to sell milk at the price of procurement is occurring and is forcing unions to dump milk in the form of milk powder as a result of which unions are making losses. The loss made by the union was transferred to the DCS in the form of late payment and further aggravated by flood. Currently payment is delayed by around 75 days which is discouraging for a farmer whose savings are nil and their daily expenditures are met through their daily wages earned from different sources because they have only one crop round the year due to the flood conditions in their village.

The second reason for failure was the severe flood last year leading to the death of many animals and the ones who survived from flood, died as an aftermath of flood due to water led diseases. In that situation, many farmers lost their milch animals which led to both fall in milk collection and membership. With this backdrop, some of the farmers who are still engaged in dairy farming are

not able to trust the union due to delayed payment and also because they didn't receive any additional assistance from the union for the loss they had because of flood.

Governance and management:

The first committee that was formed at the time of *gram sabha* is incumbent. Committee comprises of 13 members, all belonging to the backward classes. Of these 13 members, six are female and seven are male members. Current committee seemed very efficient and well informed about every issue related to DCS. Committee members meet on a monthly basis to resolve the problems..

To resolve the current issue, committee has proposed a solution on which almost all the members agreed. The major problem according to committee members is the delayed payment which seems difficult to be resolved in near future from the milk union's end. DCS does not have the fund for the payment and neither does the current secretary have enough resources. Although he is efficient in his work but being from a humble background he does not have the resources to support the dairy at a personal level. . To resolve this issue, committee has decided to give the responsibility of a secretary to a person whose financial condition is good and who can make regular payment from his/her side even if the payment gets delayed from the union's end. One of the big dairy farmer who is also a committee member has agreed to take this responsibility to revive dairy as DCS has already been given the notice from the union that if milk procurement in the village does not increase then they would not be able to provide transportation facility for milk collection which will further lead to eventual shutdown the DCS.

On discussion with the committee, we were informed that in the next annual general meeting the new secretary will be nominated. Also, they are driving awareness programs, under which every committee member is reaching out to the milk farmers and pursuing them to pour milk in the DCS. On the agitation of late payment from the pourers, the members are wooing the non-members with the new scheme which they have come up with.

To know more about the success of this scheme, we reached to the farmers. Even farmers seemed happy with the decision of committee as they can get payments on time. They are currently being looted by the private players as they are paid them less than what the DCS pays

them. Also they never test the milk and pay the same rate to every farmer, and also do not buy the milk throughout the year.

They have already proposed this plan to the milk union and the union has agreed to support them. Union has asked the DCS to increase the milk collection and membership, and agreed to provide the DPMCU to the DCS if they will reach the target of 40 litres with membership of more than 20.

Conclusion:

From the latest scheme, continuous effort from the governing body, and support from milk union, this DCS can rise again and perform much better than the way it was performing initially. Farmers will be attracted if the payment is made regularly. If the farmers choose to stay with the DCS, the collection will also increase which will ultimately lead to increase in the prosperity of the farmers and success of the DCS.

Case Study on Bhagwanpur Sikander Dairy Cooperative Society

Introduction:

Bhagwanpur Sikander DCS was incepted from December 2016 with the support of D.R. Bauroni milk union. It is located 4 kms from the block and 20 kms from Bauroni district while the nearest *pucca* road is around 1.5 km. The village is having a population of around 2000. Hindus constitute 70% of the population and the Muslims constitute the remaining 30% of the population. Amongst the Hindus, 99% are OBCs and some are Brahmins. The village has a total of 400 households out of which 250 HHs are involved into dairy farming. Dairy farmers are majorly OBC Hindus. A sizeable proportion of Muslim population in this village has migrated to other countries. Bhagwanpur Sikander is situated near the bank of a river because of which two months in a year during rainy season, it is submerged under water and during that period the entire population of the village shifts to higher plains and come backss once the water level recedes.

Operation:

BhagwanpurSikandar is a women dairy cooperative society under the scheme of NDP – I. To establish DCS in Bhagwanpur, milk union conducted a preliminary survey to evaluate if Bhagwanpur has enough surplus milk after fulfilling the demand of the village and also to make sure if it is possible for union to provide transportation without being in loss. In the initial stage, officers from the milk union had held the gram panchayat to discuss about the benefits of opening a dairy cooperative in their village, how the DCS can help milk farmers in increasing their income and how milk union can help the milk farmers in increasing the productivity of their milch animals with the help of DCS. In the gram sabha, villagers were shown the videos related to the success of Anand pattern, latest milk farming technique for improving productivity and the story of the successful DCS in the country as well as the condition of the farmers associated with these DCS to motivate them to be part of the cooperative society. During the gram sabha, committee was formed by selecting members through volunteering. Also, committee members nominated the name of the secretary. Furthermore, in gram sabha, interested members were asked to come forward and pay the Rs. 1 membership fee and Rs. 10 for one cooperative share.

From the milk union, DCS was given four milk cans, traditional milk testing unit, some rate charts, and stationery for starting the operations of the DCS. Secretary was sent for 28 days of training in the initial phase, at a training centre allotted by the COMFED, for learning the skills required for running the dairy cooperative society such as engagement with milk farmers, managing funds and management of documents. Moreover, she was given training in modern dairy farming techniques and dietary management of the milch animals for helping the dairy farmers in increasing the productivity of the milch animals. On a call from DCS, milk union also provides veterinary doctor and AI services at subsidized rate. Dairy cooperative also provides high variety seeds to DCS to distribute among milk farmers for better fodder. Apart from this, *sudhadana*, mineral and mixtures are also supplied to the DCS on demand.

DCS began with 30 members and 25 litre of milk collection per day. As of now, this DCS has a total of 110 members and it is collecting around 650 litres of milk per day from 85 active pourers; of these 60 are members and the remaining35 are non-members. On discussion with secretary, we were briefed that prior to the formation of this DCS, the dairy farmers used to consume last part of milk from their milch animals and rest was supplied to the people who are not in dairy farming within the village. No strong middleman hold was seen in the village because prior to DCS, dairy farmers were rearing milch animals just for personal use and most of the dairy farmers had the indigenous cow breed which produced lesser milk. The reason for increase in membership and milk collection is seen as the farmer took up milk farming as a business and started rearing high milk producing cows.

Moreover, for increasing production every member gets support in terms to connectivity with the regular market, Rs. 1.5 lakhs of accidental insurance cover, annual bonus, seeds at subsidized rate, mineral and mixture at door step, and Rs. 25000 of help to the family on the death of any member. Beside this, some of the farmers were sent for training at the milk union about milk farming techniques for increasing productivity without increasing cost in terms of dietary management, how to keep animals in clean and hygienic environment etc. Also members who maintain their quantity and quality of milk in both flush and lean season are given an incentive of Rs. 5 per litre from the union. For urgent requirements, DCS gives advance to its farmers or sometimes provides seed and mineral mixture on credit.

On speaking with members we understood that the major problems faced by the milk farmers is delayed payment. For resolving this problem, DCS is providing advance payment to all needy members and even when DCS doesn't have enough fund it provides mineral mixture, seeds and other items on credit which is adjusted when it receives payment from the milk union.

Governance and management:

The committee has a total of nine members all OBCs. Till now no election has been held since its inception. First election will be held after the completion of the tenure of the current committee. Some of the committee members were sent for the training to the milk union to explain them about advanced dairy techniques so they may in turn disseminate this knowledge among other milk farmers. On discussion with a committee member, she informed us that regular committee meetings are held and they have discussion over increasing the membership and collection of milk by introducing better animal management techniques to more farmers.

In last annual general meeting, farmers had complaints regarding less price paid by the DCS because secretary does not test the quality of milk regularly and every farmer ends up getting almost the same rate. To tackle this issue, the secretary requested for DPMCU from the milk union and till the time the testing machine was not received, the secretary was told to test the milk daily using centrifugal machine. Once the DPMCU was given to the DCS, where there has been no complaint regarding milk testing from the members as well as from non-members.

Moreover, the committee members also discussed about increasing membership and productivity of milch animals and also gave information about dairy techniques to all the members present there. Membership process was completed for those who qualified to become a member. For becoming a member one either needs to give more than 'X' litres of milk in the DCS or they must pour milk for at least 90 days in a year in the DCS.

Currently, member complaints are mostly pertaining to late payment. Committee knew it was not possible for them to resolve this problem on their own so they approached the milk union and presented the concerns of the milk farmers. As the village is situated in a flood prone area, people are very poor and their daily needs are met through their daily income. To resolve this problem, DCS is providing advance to the milk farmers and also providing diary related items on credit. Committee also helped milk farmers in buying fodder cutting machine etc at subsidized

rates. Regular visits are also made by the route supervisor and other officials from the milk union for evaluation and understanding the problems faced by the milk farmers. They regularly help the secretary if she faces any problem in running the operations of the DCS. The secretary act as a bridge between milk farmers and the union, she takes their problems to the union for solutions.

Future prospects:

In future DCS is planning to have a permanent place for dairy to operate. Due to flood, dairy has to shift to other location during monsoon. For better breed they intend to train someone from their village in AI to prepare AI worker with support from the milk union. Due to late auditing, DCS couldn't distribute bonus to its members. It has been decided by the diary cooperative society that they will be distributing bonus among their members in the next annual general meeting and will make more members according to the criteria specified by the apex body.

Conclusion:

Introduction of dairy in the village has helped dairy farmers to see dairy as a business for earning their livelihood. Secretary and committee members are continuously trying to involve more farmers with dairy and convincing them to perceive it as an additional source of income. With their effort and strong support from milk union, it is booming in spite of being in a difficult place.

Case Study on RamchanderpurMahilaDairy Cooperative Society

Introduction:

Ramchanderpur Mahila Dairy Cooperative Society is located 30 km from Barouni district and 2.5 km away from Bachwara block. Nearest health centre is located 2.5 km away from the village while the health sub-centre is within the village . Total population of Ramchanderpur, is 1000 persons and the female population in this village is in excess of the male population. The village is predominantly populated by OBCs and few schedule castes. Animal composition in this village is made up of around 80% cows and 20% buffaloes. Out of 180 HHs, 150 HHs are engaged in dairy farming and out of these 150 HHs, 100 pour milk in the DCS. Ramchanderpur DCS is a woman run DCS having woman secretary, committee member, as well as pourers. It was established in January 2017 with support of the D.R. Barouni milk union.

Operation:

Ramchandermahila dairy cooperative society was formed under the scheme of NDP – I under which union carried out the preliminary survey to evaluate if the village has enough surplus milk after their personal consumption for the viability of transportation provided by the milk union. , Subsequently the milk union organized a gram sabha in which villagers were given information about the dairy cooperative societies and how these DCS can be profitable to them. They were informed about the stability of income if they pour milk in the DCS and all the benefits given by union to its DCS members. Further, committee members were selected through the consensus among the milk farmers and then the committee members nominated the secretary either through consensus or voting. During the gram sabha, dairy farmer who willingly wanted to become a member of the DCS were asked to pay Rs. 1 as a membership fee and Rs. 10 for one cooperative share.

At the inception of the DCS, milk union provided all the necessary items that are required for running the DCS smoothly. DCS was given four cans, traditional milk testing unit (containing centrifugal machine), stationery, and the rate chart. DCS was started with 45 members and is currently having 71 members. While the milk collection was around 80 litres per day, currently the dairy collects around 400 litres of milk per day. The credit for the success of this DCS clearly goes to the hard work put in by the secretary who holds an HSC   In the beginning, secretary was

sent for the 28 days training to Patna the training centre where she was taught about the technique and methods related to dairy farming specially for increasing the productivity of the milch animals. Apart from the dairy methods, she got training in the operations related to the DCS for stable functioning. She was given the technical training for milk testing, fund management and other regular functions of the DCS. Besides the training from Patna, she was also given training related to latest techniques of dairy farming from the milk union.

On discussion with the secretary it was learnt that, during the initial phase, DCS was getting greater competition from middle men as they could give large amount of advance to milk farmers and DCS didn't have enough funds for such kind of advance payments. Also, she was getting lots of complaints from the farmers about the fat and price related issues when milk was tested using centrifugal machine. For countering the former, DCS had started anawareness program within the village with the help of committee members where they approached the dairy farmers and ieducated them about the benefits of becoming a member of the DCS. They were told that the middle men find it difficult to sell their milk throughout the year. Apart from connectivity with the regular market, the farmer can get other benefits from the membership of the society. They were informed that the DCSwould provide bonus in accordance with the milk sold. Union provides all DCS members insurance of Rs. 1.5 lakhs and Rs. 25000 on the natural death of any member. Farmers also get sudhadana (fodder), mineral mixture, seeds from the DCS at cost price from milk union without being charged for the transportation cost.

Moreover the milk union incentivizes farmers with Rs. 5 per litre if they maintain their milk pouring in both lean and flush season. It has been observed that lot of farmers during festive season start selling their milk outside in lure of extra money due to which union becomes insufficient to fulfill the demand at their end. To stop this practice, union has a put a cap on the pourers, imposing that union would accept the same quantity of milk from DCS in both the flush and the lean seasons. If the lean season milk collection is in excess to the flush season collection, then every extra litre would be penalized at the rate of Rs. 5. This cap is discouraging for the farmers as a result they started to sell their milk outside. To tackle this situation, DCS decided to take the extra burden on itself till this cap is not removed with the condition binding the farmers to pour all the milk at the DCS only. Although, the penalized amount is reversed back to the

DCS account after some months, fully or partially, the practice is not encouraging for the farmers.

On the discussion with the dairy farmers, we were informed that before the inception of the DCS, farmers used to sell their milk either to other DCS which is 1.5 km away from the present DCS or to the private players. Farmers prefer to avail services of their own DCS because they had to travel extra and also they were considered as outsider and no extra benefits such as insurance, bonus etc. was made available for them while they receive respect as well as business in the DCS operated in their own village.

Governance and Management:

The committee is comprised of 13 members -two from schedule caste and 11 from OBC. This is a first committee since DCS has started and no election has taken place. First election is scheduled to happen before the culmination of the five year tenure of the incumbent committee. Committee has meetings once in two months with members, so members don't need to wait for annual general meeting for resolving their concerns. Usually committee has discussion over increasing the membership, milk collection and increasing the income of the farmers. Already, around 80% of the milk farmers in the village are associated with the DCS. For attracting another 20% of the dairy farmers who sell to the middlemen, DCS secretary and committee members meet such farmers personally to explain the benefits of pouring in the DCS.   The committee also looks over the work of the secretary and ensures that the problems of the farmers, related to milk farming and DCS operations are resolved at the earliest. It was also that some of the members in the committee are also holding public position in the village such school secretary etc.

Initially farmers complained regarding milk testing, fat and price related issues. For resolving such issues, the committee members had meetings where route supervisor was also invited and it was decided in the meeting that DCS would write an application to the milk union requesting for DPMCU. Six months back, DPMCU was given to the DCS and since then not a single complaint was reported regarding the above mentioned problems. Recent problems have emerged due to the cap imposed by the milk union on the quantity of milk collection that can be done by DCS

and also late payment issues.Currently, there is a lag of 15 days in payment by the milk union. To resolve the issue, DCS gives advance payment to all the members who are in need.

All the committee members were sent for training at the milk union to educate them about the latest techniques in dairy farming and all the necessary knowledge was provided to them about increasing the productivity of the milch animals with the objective to disseminate information related to milk farming among milk farmers. Committee members seemed to be fulfilling this objective by helping other milk farmers increase their milk productivity with holistic diet and asking them not to depend solely on traditional diet.

Future prospect:

The secretary and committee members wish to connect more milk farmers with the dairy cooperative. They aim to connect 100% milk farmers within the village with the DCS. Further, DCS is planning to increase production not only through increasing membership but also through increasing productivity of the milch animals, DCS has requested the milk union to train an AI worker and a local resource person (LRP) in their village and provide better semen for more reproduction.

Conclusion:

Strong support from the milk union and continuous hardwork by both, the secretary and the committee members are responsible for the growth and success of the DCS. Even villagers are equally supporting and active in the operations of the DCS. The wholesome effort made by all the stakeholders of the DCS is helping it to grow.

Case Study on Panchrukhi (DEFUNCT) Dairy Cooperative Society

Introduction:

Panchrukhi Dairy cooperative society was formed in 2016 under NDP-I scheme with the support of Bhagalpur milk union. People from general caste, OBCs, and schedule caste make up the population of this village. Panchrukhi DCS is situated in a drought prone area where farmers have one crop per year and rest of the year they depend on savings from agriculture if they have enough surplus yield, dairy farming, and casual labor. DCS is situated 3 km away from the block and 25 km away from Bhagalpur district. The village has a total of 400 households 150 of which are involved in dairy farming on a commercial basis.

Operation:

Panchrukhi DCS was formed with the objective to provide regular and formal market access to the farmers. Before the DCS was established, milk union had the preliminary survey to assess the quantity of milk available in the village for sale, to know the type of milch animals farmers had, and methods they use for dairy farming. After the survey, milk union had organized the gram panchayat in order to educate dairy farmers about the milk union, access to as regular and formal market, benefits of being a member of DCS etc. Union had used short videos to show the success of Anand pattern to attract dairy farmers toward DCS. Committee members were nominated through consensus and then committee had nominated the name of the secretary. Secretary is a graduate and he is involved in dairy farming. He was one of those who were using contemporary dairy farming methods at the time of inception of the DCS.

At the inception, DCS was provided the entire pre-requisite to run a dairy cooperative from the milk union. They were given two cans, traditional milk testing unit, stationery, some flex mentioning the rates of milk according to fat and SNF in the milk. Furthermore, union had arranged the training for the secretary so he can understand the functionality of the DCS and run it smoothly but he did not attend the training. Although the milk union followed-up and persuaded him for completing his training, he always denied with some excuse.

Panchrukhi DCS was started with 35 members pouring around 40 – 45 litres of milk per day. It was stable for sometime then it started falling and the major reasons for its fall were mainly late payment and strong competition from private players.

In the beginning, when DCS started its operation, inspite of payment delay of around 30 days farmers were still pouring milk in the DCS because it was providing them 365 days market access and gave them price in accordance with the quality of their milk. When late payment started escalating further to around 50 days, farmers whose daily needs were dependent on their daily wages coming from different sources, stopped pouring it in the DCS. Nothing was done from secretary's end to gain confidence of milk farmers when the DCS was in dire need of intervention. He even did not bother to listen to the issues of the farmers which proved to be very discouraging for them. Till then, DCS was running as a personal dairy as secretary and some committee members were pouring into it but when payment delay exceeded 75 days, some of them left and for some their animals were not in a position to milk. As a result, it was shut down in December 2018. On discussing with secretary about his plan to revive DCS in future, he is completely dependent on his and committee member's animals.

Private market is 200 meters away from the village which has very strong hold over the milk farmers. First, they provide large advances to farmers in need and second, they pay very competitive rates, almost at par with the DCS. When payment started delaying at DCS, they started taking advantage and used this opportunity to lure dairy farmers in penury. But, the problem with this informal market is that it is not regular and does not accept milk throughout the year and this was the major reason for DCS to survive this long even without good governance, proper payment, and no benefits given to the members as was promised during gram panchayat, because DCS simply acted like an alternative to informal market.

It was noticed that even from union's end no help was given to the DCS for its survival. Till now, no steps are taken by union to either revive it or shift the dairy elsewhere. Reason for late payment can be simply explained in terms of less demand of milk and milk products produced by the milk union against what they receive from the all the dairy cooperative society. But this should not be seen as a simple supply demand problem because in Bihar there is enough market or demand for milk and milk products which other companies like AMUL, Mother Dairy, ITC

&, Patanjali are acquiring. It should be seen as a lack of marketing instruments to fulfill the demand.

Governance and management:

Current committee which was formed during gram panchayat comprises of 13 members out of which six are females, five OBCs and one schedule caste, whereas seven are males, five OBCs and two schedule caste. Till now, no annual meeting has been held and rarely few committee meetings were held having discussion over increasing milk collection but nothing was done in that regard. Discussion with some of the committee members revealed that some committee members do not even know about fellow members in the committee and have never attended a single meeting.

We were informed that members had approached the committee regarding the late payment and low price as milk testing was not done on a regular basis. For resolving these problems, the committee had asked the secretary to test milk regularly, which was followed. But they still got low prices because of following old methods. After milking the animal in the morning, they set their milch animal free for grazing in the open field. As this is a draught prone region, most days in a year the daily diet of the animal is overlooked which results in lower production as well as affects the quality of the milk. No measures have been taken to counter this issue by the committee and secretary as none of them had gone for the training arranged by the union.

Dairy farmers:

When we tird to approach the dairy farmers in the village, initially they refused to talk to us as they were anguished with the DCS and the milk union as their payment had still not been done, but on insisting, few of them agreed to talk to us and reported their concerns regarding late payment, not fulfilling the promise of payment of bonus and other benefits as well as offering lower price than the private market.

Future prospects and conclusion:

Presently, union has intervened to revive the DCS and called for a village meeting. They are also considering about changing the current secretary and some of the committee members. But before this, the union should be consider paying farmers on time and introduce them to the latest

dairy farming methods through which they can increase their productivity as well as the quality of milk. Union should also train AI worker and local resource person (LRP) in their village who in turn can help the dairy farmers in increasing the quality of their milch animals to maximize their output. Regular veterinary services and vaccination camp should be arranged for the farmers from milk union.

The biggest hurdle for dairy farming can be seen in the patriarchal nature of the village. In this village, women are not allowed to go out of their households as it is seen as a disgrace for the family. In dairy farming, where major work is done by the women, keeping them out of the business is deterrent for growth of dairy farming in the village. Union should consider about converting this Panchrukhi DCS into women DCS.

Case Study on Darpa Dairy Cooperative Society

Introduction:

Darpa dairy cooperative society started its operations from July 2016 under the scheme of NDP-I with the support of Bhagalpur milk union. The population of Darpa village is around 2000, where female population exceeds the male population due to high migration from the village. OBCs constitute a major chunk of the population. Darpa is located 9 km away from Rajaun block and 30 km from Baka district. There is no pucca road near the village, to reach the pucca road one needs to travel around 5 km from Darpa.

Operation:

Operation of the dairy cooperative started in July 2016 after holding a gram sabha at the village. Prior to calling the gram panchayat meeting, the union had carried out preliminary survey to know if enough surplus milk is available in the village and whether providing transportation facility will be viable for the milk union. Committee was formed by nominating the members with consensus during gram sabha. This was followed by the committee members nominating the secretary according to rule implied by the apex body. Officials from the milk union also tried to introduce latest dairy farming methods to the milk farmers with the help of short videos on the success of the best dairy cooperative societies. Villagers were told about the opportunity to enhance their household income with the help of dairy farming and benefits being a part of the DCS.

They were guaranteed about providing regular and stable market where they can sell their milk at appropriate rate according to the quality of milk they would pour in the DCS. Help would be provided in learning new techniques through secretary, committee members, and special camps. Secretary and committee members were given training by the milk union and special training was arranged for secretary from the milk union to understand and learn the daily operation of the DCS. These trainings were given to them in order to disseminate information and methods among milk farmers. Furthermore, milk farmers would get yearly bonus in accordance with the amount of milk poured by the members. Mineral mixture and milch animal food would be available at the DCS level and high yield seeds would be made available for more fodder at

subsidized rate. Profit made by the DCS over a year would be distributed among all the farmers in proportion to the amount of milk poured by them.

Darpa was started with 42 members contributing 40 litres of milk per day. DCS sustained its milk collection till December 2017 when then secretary had to step down from the position and new secretary was nominated because the former secretary did not have enough time to run the DCS operations due to is educational commitments ofpreparing for some competitive exam. The newly appointed secretary did not have any experience nor training to run the DCS which led the collection to fall down to 10 litres per day in the beginning of January 2018. By end of January 2018 the collection declined further and ultimately the DCS was shut down.

After the shutdown, milk union intervened and called for another village level meeting and revived the DCS on 17th June 2018. This time the secretary was sent for 26 days of training for understanding the operations of the DCS. He was trained on aspects such as managing fund, milk testing, file management, dealing with milk farmers etc. In this entire process, no change was made in the committee.

DCS started yet again from three to four litres per day poured by three active members. Currently, milk collection has risen to around 20 litres per day from similar number of milk farmers. It has been notice that there is no competition to DCS from private players and any nearby dairy cooperative society. Village is situated in a destitute region of Baka district where the literacy rate is low because of which the farmers are still using old methods of dairy farming resulting in lower productivity. Lower productivity and higher consumption in the village is making it difficult for the DCS to increase collection. On the other hand, major amount of milk is sold to the households in nearby villages populated by Brahmins and very few villagers are involved in dairy farming in those villages.

At the inception of the DCS, milk union had provided all the necessary support for smooth functioning of the dairy cooperative, such as two cans, traditional milk testing units, rate chart, and stationery.

After the revival of DCS two major problems were reported by the milk farmers, late payment and testing of milk. Currently, the turnaround time for milk payment is around 75 days which is ademotivating factor for the milk farmers to further associate with the DCS. Farmers shared that

the DCS is still running because they don't have any option to sell their milk. Milk testing issues will be resolved soon as union has already provided the DPMCU for better and easy testing.

Governance and Management:

Committee is comprised of 11 members all belonging to the OBC. Out of 11 committee members, 6 are females and 5 are males. Some of the committee members were very active and were recognized by the milk union. Union had given training to the committee members at the union level for increasing the productivity of milk through latest methods. Committee convenes their meeting once in two months and staunchly backs the problems faced by the milk farmers.

On the problem of milk testing, committee wrote an application to the milk union for better and easy machine on which milk testing can be done regularly. They are also helping secretary in operating DPMCU. Distribution of bonus has not been completed due to delay in auditing. The resolution for late payment issue proposed by the committee was to give advance payment from the DCS. But, due to lack of fund with the DCS, it is not possible.

The committee had also demanded for an AI worker and local resource person (LRP) to be trained in their village. These steps according to the committee can help the milk farmers in increasing the productivity of the milch animals and their dairy income. Committee members do help other members in adopting latest milk farming techniques.

Future prospects and conclusion:

To enhance the milk productivity and membership, DCS has decided to send some milk farmers to milk union to get trained in newand advanced dairy farming methods. DCS plans to distribute bonus among their members in the next annual general meeting,. As DCS has been given a DPMCU, milk testing will begin immediately after the completion of training of the secretary. Then every member and non-member will be provided the rate on the basis of the quality of milk they pour in the DCS. Committee has already demanded for AI worker, veterinary services, and local resource person (LRP), so farmers can benefit from them and enhance their income by increasing the quantity of milk they pour.

DCS along with committee has decided to provide small advance payment to milk farmers in need if payment gets further delayed depending on the availability of funds with the DCS.

Monitoring and support by the route supervisor and other officials from the milk union has helped in rectifying the mistakes.

Effort from the secretary, milk union, and mainly from committee members has helped to revive the DCS. Continuous efforts and acceptance towards new methods from milk farmers will help them in increasing the milk production as well as the income in the village as more farmers will associate with the DCS.

Case study on Rampur (Defunct) Dairy Cooperative society

Introduction:

Rampur dairy cooperative society is located 13 km from the Rajaun block and 40 km from the Baka district. The Rampur DCS was established in April 2016 under NDP – I with the support of Aurangabad milk union. Sex ratio in a village is same. Most of the population in this village belongs to other backward castes thus a majority of the dairy farmers also belong to OBC. Rampur village comes under one of the most backward area in Baka district. The nearest pucca road is around 10 km from the village.

Operation:

Rampur DCS started its operations with around 30 members having total milk collection of around 35 litres per day. DCS was formed in April 2016 after the gramsabha was called by the milk union. Before gram panchayat, milk union conducted the preliminary survey in the village to evaluate the availability of milk surplus after fulfilling the village consumption and to consider the viability of providing transportation to the DCS, Milk union briefed the villagers about the benefits offered to the members of the DCS such as access to regular milk market, bonus, price on the basis of quality of milk, training etc.

With the consensus from milk farmers, dairy cooperative was opened in the village. Milk farmers selected the committee members who they thought would be right for the development of the DCS. Selected committee members nominated the name of the secretary on the basis of rules and regulations implied by the apex body. In the same meeting, interested milk farmers were made members. Secretary is a SSC holder who started working actively. Within a short period around 30 members were pouring around 35 litres per day. The secretary was approached by the milk union to send him for 28 days of essential training where he could learn about the smooth operations of dairy cooperative society in form of fund management, documentation, dealing with people, and to learn about new and better dairy methods to improve animals productivity but he dit not attend the required training. Lack of training affected the operations and management of the DCS leading it to become a defunct DCS. From 35 litres the collection dropped to 5 litres in March 2018 coming from only 2 members including himself and another committee member.

On inception, the DCS was provided with all the basic and necessary equipments by the milk union necessarily required to run the DCS; which included 2 cans, basic milk testing unit, stationery and rate chart. It started operations from the home of the secretary. Since then farmers had started complaining about offering the same price to all because the milk was not tested regularly as was promised initially. But no steps were taken from end of the DCS to resolve the problem which made them approach the committee where they presented the problem but no resolution was provided. This ultimately resulted in plunging of both milk collection and active membership.

Another reason for the doom of this dairy cooperative was late payment. From the beginning there was delay in payment by the milk union. The lag was around 45 days in 2017 which further went up to 70 days at the culmination of the DCS. DCS was run by untrained work force. Since the secretary was not vey sound economically, he had no funds for advance payment from his side for the sustenance of the DCS. Additionally DCS did not have any funds itself to sustain.

The third major reason was strong competition from the nearby DCS. The only reason that milk farmers were pouring in another DCS in spite of facing similar scenario was because they were able to get advance payment from the dairy. The secretary of that DCS owned a grocery shop and hence his financial condition was much better than the incumbent secretary. Even for him it was not possible to pay everyone in cash, so he started giving essential grocery items to milk farmers on credit which was a big motivation. He also keeps cattle feed and mineral mixture in his shop which he gives to farmers on credit basis whereas the DCS secretary does not keep all these items which are important for increasing the productivity of the milch animals. No market is near to the village so there is no competition from any of the private players. Neighboring DCS also makes payments to milk farmers based on the quality of the milk supplied by them.

Our discussions with milk farmers revealed the same picture as they told us about their milk not getting tested, about late payment and no benefits being given to them which were promised during the village meeting. To sell their milk, farmers have to go to another village. One of member told us that they are going there because their village DCS is not working fine and also secretary of the neighboring DCS provides all the relevant information about new dairy methods but they do not wish to continue going there as they have to travel around 2 kms and secondly they feel ashamed since that is not their village.

113

Governance and Management:

The current committee comprises of 11 members 5 of which are females and 6 are males. Till now, no changes have been made in the committee as they are yet to complete their five year tenure. Usual committee meeting used to take place once in three months. No committee member has received any kind of training about dairy farming techniques or conducting their job efficiently from any source.

In the beginning, dairy farmers had approached the committee about their milk not getting tested regularly. To resolve this problem, committee asked secretary to start collecting milk through regular milk testing. This was followed for some time then discontinued. No further steps were taken by the committee in this regard.

When dairy farmers raised the issue of late payment with the committee, they were simply told that nothing could be done. It has been noticed that even some of the committee members are also going to nearby village to sell their milk. Being in abackward area milk farmers are devoid of the latest methods and the usefulness of the high breed milch animals. Most milk farmers own less productive animals hence it is easier for them to sell milk to their neighboring DCS.

Conclusion:

Absence of training of dairy officials made the basic operations of the DCS tedious for them. Less productive animals further reduced the overall milk supply of the village which proved a reason to sell to the alternate source. Most of the dairy farmers are dependent on their daily income or regular income from dairy or other sources like casual laboring to fulfill their daily needs. Discussion with the secretary and committee members revealed that they do not have any concrete plan to revive the DCS again. Although, milk union is trying from its end to revive the DCS again and frequently approaching secretary and committee members to restart the operation again but they do not have any solution about late payment.

Case study on Kasabkheda Dairy Cooperative Society

Introduction:

Kasabkheda Dairy Cooperative Society (DCS) is located around 5 km from Virul block and 30 km from Aurangabad district. It is situated in a drought prone area. The total population of Kasabkhedavillage is around 20 thousand with around 11 thousand male and 9 thousand female population. The population of the Kasabkheda village is comprised of all the caste categories including General, OBCs, Schedule Cast etc. Kasabkheda DCS was formed under NDP – I scheme in September, 2013 with the support from Aurangabad Milk Union.

Operation:

Kasabkheda DCS was established after a public meeting conducted by the milk union in the village after taking the necessary permission from Kasabkheda Gram Panchayat. Kasabkheda was chosen by the union for establishment of DCS under the NDP – I scheme on the basis of a baseline survey of the households and their livestock holding conducted by Livestock Development Officer. On the basis of baseline survey, government dairy conducted a preliminary survey to evaluate the amount of surplus milk available in the village and to reckon if DCS establishment in the village would be viable to the milk union in terms of the transportation cost.

On the basis of a report from LDO, preliminary survey conducted by milk union and necessary permissions from Gram Panchayat, Aurangabad Milk Union proposed a dairy cooperative society in Kasabkheda village during a public meeting. Once the proposal was accepted by the dairy farmers with a condition of having at least 51 members agree to become a member of a DCS. To become a member of DCS, dairy farmer needs to pay Rs. 100 as membership fee and Rs. 10 for one cooperative share. During the public meeting, milk union official had given the information about the DCS and the support DCS would receive from the milk union. They also discussed about the benefits of becoming a member of the DCS such as regular market to sell milk, bonus, information about improved dairy practices etc.

Kasabkheda DCS started its operations soon after the public meeting. At the inception, milk union provided all the necessary dairy equipments, such as 4 cans, lactometer, stationary, and rate chart for running the DCS smoothly. After few days, the secretary of the Kasabkheda DCS

was sent for a training of 21 days at the government training centre. In the training centre, secretary of the DCS was given training on basic operations of the DCS such as milk testing, fund management, documentation, dealing with the dairy farmers etc. Besides, he was also given training on ration management with an objective of disseminating information among the dairy farmers.

Currently, all the operations of the DCS are going on a place taken on lease for 20 years by the DCS. It follows the payment cycle of 10 days. All the payments made by DCS are done directly into the bank accounts of the dairy farmers. The same account is also used by the union to transfer bonus or any kind of subsidy either directly from milk union or through other programs or organizations or the government. DCS also donates some amount of money for social obligations like Ganpati and Navratri Utsav. It is worthwhile to mention that the DCS also donated for the wellbeing of the families of the defense personnel martyred in the Pulwama attack.

The DCS commenced its oprtaaions in Sept, 2013 with only one active member out of the 54 (founding members) who poured around 1.5 litre of milk. It increased to 400 litres per day with 72 active members in March, 2014. The region then was hard hit by the draught resulting in low price of milk and so dairy farming became non-viable for milk farmers. High rate of water also added to this because the farmers had to buy water from outside due to the draught. In November, 2016 the milk procurement fell down to 200 litres per day from 32 members and it further plunged to 100 from 3 members in the current year (March, 2019). These 3 members are also the committee members of the DCS.

When DCS was booming initially, DCS had bought 6 more cans and DPMCU on subsidized rate from the milk union. The major reasons for the falling of this DCS can be attributed to mainly two factors: first, due to severe draught situation and scarcity of water. Water became so expensive that the farmers were not able to provide enough water to their milch animals for their surviva.l Secondly, the situation further aggravated due to a fall in milk price as the union was not able to sell milk powder at appropriate rates. Succumbing to these issues, most of farmers had to sell their milch animals at lower rates.

Those who are still in dairy farming had disassociated with the DCS and started selling directly to hotels, cafeteria, lassi house etc. as there they get around Rs. 30 for cow milk which is enough to make dairy farming viable whereas from DCS they could get maximum Rs. 25 including the help/subsidy of Rs. 5 given by the state government. Another problem faced by the milk farmers was that DCS rejects the low quality milk but does not pay according to the quality of the milk if milk quality exceeds the specified rate. Membership was stagnant throughout the period because membership fees seemed high to the farmers and there is no special benefits which is exclusive for the members except for the bonus.

Support given to the dairy farmers:

Apart from the regular market provided by the DCS, it distributes annual profit among its members in kind such as rice, sugar, lunch box etc., To help milk farmers to connect with the banking system, annual bonus or price difference is given by the milk union directly to the farmers in their bank accounts. Veterinary service is provided by the government doctor, and DCS buys the milk directly form the village but pays transportation cost from its own fund. The milk is collected from the nearest highway as milk union's milk truck does come directly into the village. Rs. 5 help/subsidy given for every litre of milk pours in the DCS from the state government. Except from bonus, all other benefits are also extended to non-members too.

Governance and management:

Current committee of Kasabkheda DCS is comprised of 11 members, out of which there are 9 male members and 2 female members. No changes have been seen in the committee after the first election held last year. All the committee members were sent for training under Ration Balancing Program (RBP). The program intended to increase the milk productivity of the milch animals in the village. Committee was always active in helping members for the dietary management of the animals. Also, every year annual general meeting of the DCS is held which is usually attained by around 35-40 members.

Committee was also active in resolving issues too. DCS Committee holds monthly meetings, where it evaluates and discusses the monthly progress and issues of the dairy farmers. In the beginning, farmers were facing problem in milk testing as what was told by the secretary about their milk quality used to differ from what they used to get from the milk union. To resolve this

issue, secretary along with committee had decided to buy DPMCU. All the complaints faded away after the purchase of the DPMCU.

Severe draught, water scarcity and plunging milk price seemed impenetrable for the DCS and its core committee which ultimately resulted in fall in milk collection and active membership. Committee tried to talk to its members as well as to the milk union to find some solution but it did not work and nothing was done in this regard.

Future plan:

Now, the committee has come up with unique plan to revive the DCS. They have decided to help every willing farmer to take loan from the bank for which they are approaching the villagers. Secondly they have also offered to take the burden of digging a private pond for all the milk farmer,s on request, for water storage during the summer season

For promotions, DCS has its own cricket team which plays against other cooperative or corporate teams (in cricket tournaments/competitions). They also have a desire of sponsoring a rising wrestler who can represent India. For tackling the competition faced by the private players like tea stall, lassi centre, cafeteria etc DCS has decided to approach milk union for taking permission for open selling of cooperative milk as private market seller.

Conclusion:

Unavoidable situations like severe draught and fall in the price of milk powder that led to fall in the price of milk have dragged a flourishing DCS into doom. Powerful steps and giant efforts are the demand from the DCS as well as from milk union for countering the current situation.

Case study on GavaliShivra Dairy Cooperative Society

Introduction:

Gavalishivra DCS was established in Feb, 2013 under the scheme of NDP – I with the support of the Aurangabad milk union. This DCS is situated around 30 Km from Gangapur block and 35 km from Aurangabad district. The total population of GavaliShivra village is around 3500 out of which 1800 are males and 1700 are females. The population of the village is comprised of all the major cast categories. The village comes under draught prone area.

Operation:

GavaliShivra DCS was started with the collection of 5 litres of milk from 1 active member out of the total of 51 members. Presently, DCS has reached to the total milk collection of 1000 litres coming from the 72 active pourers including members and non-members. When DCS was started it was given 4 milk cans, measuring cup, tray, traditional milk testing unit (including centrifugal machine) for the easy operation of the DCS. Secretary, who is a graduate, was sent for the 21 days of training at the government training centre to learn about the daily operations of the DCS such as fund management, file management, dealing with dairy farmer etc. This training also included the ration management of milch animals, making of vermin-compost, etc. Knowledge gained from the training was further disseminated among members through 1 day open class held by the secretary at the DCS.

The secretary had a strong inclination towards dairy farming. There was no private market in the nearby village which forced the milk farmers not to increase milch animals. Secretary approached milk union after visiting many DCS's in the nearby villages and proposed the union to start a dairy cooperative society in his village. During that phase, NDP – I scheme was active The milk union had asked for the report from the Livestock Development Officer (LDO) to conduct a preliminary survey through government dairy. Later, the permission of gram panchayat was sought by the union to conduct a public meeting in the village. Once the 51 dairy farmers agreed to become member of the DCS, committee was chosen from consensus among milk farmers. Then, secretary was nominated by the committee to run the DCS. Further, milk union had educated dairy farmers about the latest milk farming techniques and benefits to

become a member of the dairy cooperative society such as bonus, regular payment, cattle feed, mineral mixture etc.

Full fledged operations of the DCS started in Feb, 2013. The only complaint of the farmers was about milk testing which used to take a lot of time and they had to wait for long period in queue. That problem was solved in 2015 when milk collection expanded large enough to buy a DPMCU. Every month DCS calls for informal public meeting to help and teach dairy farmers in adopting new methods. Currently, all milch animals in their village are inseminated using AI technique. Every year DCS takes its members to the agriculture university to learn new methods for increasing productivity of the milch animals.

Cooperative started its collection from a small rented place, now it is collecting milk at a big place taken on bond (lease) for 3 years. During the expansion of the DCS, it has bought 11 more cans, weighing machine, fridge, and computer with printer. Cooperative also makes contribution in religious function and help orphans by providing free milk. Payment is usually made after every 10 days in the bank account of the dairy farmers including members and non-members. When DCS was started, most of the farmers had only 1-2 cows, the milk from which was used only for personal consumption. After the persistent encouragement made by the DCS in the form of advance payments to buy more animals, it has enhanced both the productivity of the animals and milk collection at DCS. The milk union from its side has helped DCS to fulfill its effort by giving advance payments to the DCS. With the assistance received from the milk union, DCS and personal contribution from own pockets of the farmers, has helped them to buy more and better milch animals. This facility is available only to the members as well as non-members from GavaliShivra village but not to the non-members coming from the nearby villages.

From last year, farmers are facing a problem of low rate for the milk. But, this problem was somewhat solved through Rs. 5 per litre help/subsidy from the state government. It was started from Aug, 2018 and now from March, 2019 Rs. 5 help is reduced to Rs. 3. One major reason that the milk collection at GavaliShivra DCS did not drop is the absene of any alternate or private market nearby to sell the milk. another reason can be, the location of the village which is a draught prone area where the possibility of making profit through traditional agriculture seems scanty and these farmers therefore rely on dairy farming to meet their family's end needs.

Support given to milk farmers:

Dairy farmers who are associated with DCS are given regular market to sell their milk, subsidy on cattle feed, subsidy on mineral and mixture, bonus, advance payment to buy animals, training, profit distribution from profit made by the DCS, fodder cutting machine at subsidized rate, veterinary services etc. They also get support from state government through district milk union.

Farmers told that they were sarisfied with the functioning of the DCS and its committee. They informed that they did face a problem related to milk testing during initial period, but that too was resolved after the arrival of DPMCU. Inspite of being in a drought prone area, farmers in GavaliShivra village seemed unaffected because they have their own personal pond to extract water for the entire summer. They are worried about continuous fall of the price of milk but they also understand that this matter is beyond the control of the DCS.

Governance and Management:

At the time of inception of the DCS, committee comprised of 11 members including 2 female and 9 male members. DCS's first committee election was held last year in 2018 after its establishment. As committee was doing its work efficiently, no changes were made in the committee and the same members were re-elected with consensus. Although 2 members left the committee for some personal reasons, currently, committee comprises of 9 members, out of which, 1 is female and 8 are male.

All the committee members were sent for training under Ration Balancing Program (RBP). The program intended to increase the milk productivity of the milch animals in the village with the objective of disseminating knowledge among milk farmers. *At the commencement of the DCS, committee members along with the secretary had visited each and every home in the village to make them aware about the benefits of being associated with the dairy cooperatives.*

Beside this, they have regular committee meeting for the discussion over issues in running the DCS and problems faced by the dairy farmers. There is no fixed timeline but it is mostly held once in two weeks. Milk testing problem did exist but it was resolved after the purchase of the DPMCU. Committee is also active in helping farmers in adopting new methods.

Future prospects and conclusion:

DCS has two objectives to fulfill in the future: First, to buy a Bulk Milk Cooler (BMC) for two reasons, primarily the DCS plans to increase its milk collection capacity from 1000 litres to 2000 litres and secondly, the DCS needs to collect milk very early in the morning, as GavaliShivra DCS falls on the first place on the milk collection route of the truck which creates inconvenience to the dairy farmers. They will be given AMCU under central government scheme for better and fast milk testing.

Continuous hard workby secretary and committee members along with favorable conditions like absence of any outside competition along with the support and trust from milk farmers has helped GavaliShivra DCS to do their best.

AbianaKalan: A case of able leadership

AbianaKalan DCS comes under Ropar Milk Union in Noorpur block. The distance of AbianaKalan from Ropar is around 18 Kms. It was started in 1993 but received support under NDP I in 2013. The DCS collects around 1700 liters of milk per day. There are 140 members in the society and 9 members in board including 2 female board members. The village has 700 households and not all the households are in dairy and agriculture, hence the membership is at the current levels. The secretary does not see significant increase in membership in the future.

According to the members, the Chairman, Mr. Mahendra Singh who is an ex-army official has played significant role in the development of the DCS. His efforts have helped the DCS get support and maintain good membership. There are no big dairy farmers in the village for milk collection and in general the contribution of milk by members is steady.

Mahendra Singh, Chairman - about the activities of this DCS in the past 3-4 years:

"Earlier this society was in a different place, no one knew much about it and no one did much to improve it. The earlier Chairman also did not put efforts in improving the society. Later villagers insisted to put me as their Pradhan. I took initiative to improve the DCS, made changes in the working of the DCS and brought in more transparency. I took the control and asked the sarpanch who again is an ex-serviceman for land and then we got this current place in 2013. Then we started with the construction of building and have spent 6.5 lakhs from our own funds. We also received Rs 1 lakh from the District Milk Union for the building. Since 2013, we have received support from the District Milk Union with AMCU and BMC. We have got profit of around 12-13 lakhs because of all this support. Supply of milk and profits have increased a lot because of better technology, better place thus leading to better quality of milk. Although we have faced difficulties like note bandi and plant closure for some time due to some issues but we have done well despite the problems. During note bandi we distributed 6 lakhs rupees from our fund to the suppliers and later got the same reimbursed while we also paid 4 lakh rupees during the plant closure. BMC has helped us a lot and people are with us because we have always supported them and given them proper and on time payment."

The DCS is built on the land provided by the Gram Panchayat in 2013. They received support for this building from the district milk union. They have spent Rs 6.5 Lakhs on the building and

infrastructure and they have received support from the milk union for this worth Rs 2 Lakhs and the remaining capital was accumulated through their own funds.

The DCS provided Rs. 1.5 Lakhs from their profits for building/development of a school ground in their village. No one in the Board of the DCS is associated with the Gram panchayat formally but shows strong linkages with the governing bodies in the village.

During the demonetization, the DCS made arrangements to support members for cash and other related issues which were appreciated by the members and the village in general. To help other people, members paid from own funds to help them tide over the issues faced during that period.

The election of the board and chairman was done through consensus. Three members have been re-elected and the current chairman has also been re-elected. He has been the chairman of the DCS for past 15 years. This year, 130 people including the non-members attended the meeting. Last year around 100 persons attended the meeting. The major issues discussed in the annual general meetings have been on bonus to be distributed from the profits of the DCS. The transaction between the DCS and the members is through cash, as is preferred by the members. Cleanliness of the premises was another issue that was discussed in the meeting and resolution was taken on ways to keep the DCS clean. Distribution of milk cans to members was also discussed.

One of the major benefits of being the member of the DCS is the veterinary support received through the DCS. Doctor visits the DCS every month and provides with free medicines for the milch animals. In case of emergency, they call some local doctor but are reimbursed the expenses incurred on medicines. Members also get mineral mixture and fodder at subsidized rates. The DCS does not provide loan to its members, they have informally lent money to buy cattle and the same is mostly returned. There is no formal structure for providing loan through the DCS.

The DCS staff was provided training for computers. DCS chairman has gone for training a couple of times to the Ludhiana training center.

The DCS has received considerable support from the district milk union. They have received milk cans at subsidized rates for its members. They have received BMC and AMCU under the

NDP I support. This has helped them improve transparency and milk quality which has helped them increase milk collection over a period of time.

DCS has employed three persons: 1 secretary and two helpers. According to the members, the secretary is efficient in his work and conducts his duties diligently. He is active and has supported the chairman in working towards making the DCS better over the time.

People are not interested in supplying milk to private dairies as they cannot provide the support they receive from DCS. Private dairies do not make payments on time and question the quality of the milk supplied. Over the period milk supply to the private milk players has stopped completely.

In general the members are very happy with the DCS secretary and chairman. The trust among the members and the board is very high and as a result the members provide milk regularly to the DCS. The governance structures however are not strong and the DCS runs mainly on the leadership of the chairman. They are making profits and as per the cooperative structure they are retaining the money in their bank accounts. The capital accumulation over the period has been strong and has been utilized for welfare and creating assets. This is a good sign and shows that the DCS can sustain in the longer run. The DCS was started a long time back in 1989 and received support from the milk union under NDP in 2013. It closed down a couple of times and but it started doing well post support in 2013. Thus, a DCS to mature and receive support from the society takes time post which it becomes an important structure in the society.

Case Study of Phulere Dairy Cooperative Society

Phulere is a small DCS in the Noorpur block in Ropar district and is situated at around 22Kms from Ropar. The village has around 45 households but the DCS has been able to get 70 members in the DCS. They have been able to get membership from villages around Phulere, like Haripur and Khatana, who do not have their own DCS. It was registered in 1993 and received support in 2013. The DCS collects around 800-900 liters of milk per day.

Currently, around 20 non-members are pouring milk in this DCS. According to the secretary, non-members pour milk so that they can get membership. They receive memberships only if they pour milk regularly for a year. In general, there is no other motive for non-members in pouring milk. DCS provides all the support like mineral mixture, fodder, veterinary support at subsidized rates to members as well as non-members. Usually the non-members become the member after financial year end audit post whichtheir names are included in the list.

As per the discussions with the pouring members of DCS, Gurnain Singh is one of the members who supplies maximum milk to the DCS which is around 150 liters per day. The members said that no special preference is given to him or any other members. All the members get same level of support from the DCS and the officials of District Milk Union.

There are private dairies in and around Phulere which also collect milk from people. The prices provided by them are mostly the same as those provided by the District Milk Union but they do not provide any benefit except that sometimes they provide credit.

This year the AGM was attended by 50 members as compared to the last year when it was attended by only 30-35 members. The major issues discussed in the last AGM were:

1. Price difference/ variation
2. Farmers' strike which disturbed the supply for 5 days

The DCS was not able to supply milk for 5 days to the milk union due to farmers strike and it affected the members as they were not able to sell their milk. The District milk union officials were also not able to help in this case. BMC has been installed 3 months back and it was discussed in the AGM about the changes which need to be incorporated in the functioning of DCS due to the BMC. The agenda brought out in the last board meeting were:

1.BMC needed Helper.

2.Price difference distribution between members.

3. Bank money withdrawal for paying price difference to members.

DCS has received a grant of Rs 2 lakhs in 2 installments from the District Milk Union for building (infrastructure). DCS has spent a total of Rs 6.5 lakhs with Rs. 2 lakhs from District Milk Union, Rs 2.5 lakh from their profits and remaining has been through informal credit by members, chairman and secretary.

The DCS has recently received support for installing BMC and have AMCU from 2013. This has helped them get members over the last 5 years as it has brought in more transparency, flexibility in milk collection and also shows that the DCS is more advanced. BMC is helping members get better dividends from the DCS as the District Milk Union pays Rs 0.35 per liter for milk cooling to DCS. Approximately Rs. 0.15 -0.20 per liter is the expense and Rs 0.20 per liter is the saving.

They do not provide support for opening bank accounts and have DCS's bank account. They pay cash in every 10 days to the members for milk supplied. They do not understand the benefits of bank account for members and no understanding of various schemes under financial inclusion. This can be seen in the growth of membership in this DCS. One member was provided an amount of Rs 20,000 when his mother died through some support funds by the district milk union.

They have a tie up with ICICI bank for providing loans to members. The bank takes information from the DCS for the members interested in taking a loan. The bank collects last 3 year's data on the milk supplied to the DCS and on the basis of that loan is provided to the members who require it. This scheme has just started and some application were in process at the time of the interviews with the members

Veterinary doctor visits every 15 days and in case of emergency they are sometimes provided services by the veterinary doctor. Else, they take support from local doctors and the medicine expenses are then reimbursed. In this case, they have to bear the GST charges. They are satisfied with the mineral mixture and fodder support which they receive from the district milk union.

Around 20 members are purchasing mineral mixture and fodder from the DCS. Others are depending only on their farms for providing food to the cattle.

Secretary of the Phulera DCS is very active and has taken all the initiatives for getting support from the milk union. The board members were active and understood their roles and responsibilities in the functioning of the DCS. This DCS is an example of an efficiently run DCS due to the active participation of the staff and their inter-personal relationship with the board and the members.

Both Phulera and AbianaKalan are true examples that the support from the District Milk Union plays a vital role in the success of the DCS. There is a symbiotic relation between the District Milk Union and the successful DCS as the support helps them get better quality milk and increased quantity of milk. Thus, support to DCS from District Milk Union is one of the most important factors for sustainability of DCS.

Case study on JasseMajra Dairy Cooperative Society

JasseMajra DCS is located in the Ropar district and Anandpur Sahib block. It is around 30 Kms from Rohtak and has 30 members. Milk collection from this DCS is around 300 liter per day. It was started in 1990 and then it stopped in around 2005 and started operations again in 2014 with the support under NDP I. They received support to buy tables, chairs and other basic items. This DCS does not have AMCU and BMC.

There are two DCS in this village of which the other one is a woman DCS. The village of JasseMajra has around 50 households with membership from the village being shared by the two DCS. Apart from membership from this village, there are other small villages from where villagers are also members in this DCS and are pouring milk. According to the chairman, the membership can be increased by making payment on time, keeping DCS clean and giving right price in terms of solids and fat measurement. This can happen with an AMCU system,but currently they are using a fatometer.

The office has been rented in the premises of the Chairman's house. Even though the Chairman said that they have tried to get land and office from the Gram Panchayat for DCS but there are no honest efforts as he would lose out on rent. The Chairman is a young person from the village and he is also actively involved in Yuvak Seva club.

The chairman was selected through consensus. The members of the board meet every year twice and the AGM meeting is held once in a year. AGM meeting was held two months back and 15 members attended the meeting. The major discussion was around payment to members from the profit of the DCS. The meeting seemed very informal with no particular issues discussed in detail. They have recently stopped plastic milk cans and are providing milk other milk cans to the members. They also plan to give more milk cans to the members through the DCS profits and are also seeking support from district milk union.

Secretary comes from other village and as per the members he is hard-working and honest but lacks initiative and is not an efficient manager. As per the members, the major issue in the last one year has been bonus not being distributed. The other issues are the late payment and computer entry related issues.

This is an example of a small DCS with very few assets. Leadership is weak and secretary is honest but needs to take more initiative, even then the DCS is doing well in terms of milk collection due to the need of this business in this area. As per the members, in this region of Punjab, the land is not very conducive for farming accounting to its hilly nature. Thus, milch animal is one of the major sources of income. Hence, if proper support structure is provided with able leadership and efficient staff, this DCS and other DCS in this region can flourish.

Case study on Leharian Dairy Cooperative Society

Leharian is a women DCS and it comes under Anandpur Sahib block in Rohtak district. It is around 30 Kms from Rohtak and has 68 members. There are 140 households in the village and there are two DCS in the village. This DCS was started in 2009 and started receiving support under NDP from 2013. They received AMCU in 2018 and do not have a BMC.

The average milk collection per day is 600 liters. There are 2 members who supply more than 50 liters per day. The chairman and secretary are fair with everyone and there is no special treatment on the basis of milk supply.

The current chairman is AmritKaur and she was elected in August 2018. The members elected her by consensus. There are no board members in the panchayat or any village level committee. The interaction with other village community activities and intuitions is minimal. The last board meeting was conducted in January 2019. In the last AGM, around 60 members were present. The major discussion in the meeting was about having a building under the gram panchayat. Currently, an office has been rented in the village. The discussion on the benefits of AMCU was the agenda in the AGM meeting.

The members though have an option of getting animal insurance at 75% discount with the help of the District Milk Union, but none of them are taking this support. None of the members are buying feed from the DCS and very few members are buying mineral mixture. The members are not buying feed as they have alternative arrangements which are due to their involvement in farming. Also, the awareness about the benefits of using mineral mixture and feed seem absentThe major problems faced by the DCS as per the members is the;e small office space which sometimes creates a problem for them. They feel that BMC will not only help them improve the quality of milk but also increase milk supply due to reducing the constraints and generate revenue.

The secretary of the DCS is quite active and makes sure that members receive payment before time. The office building is on rent and they pay Rs 800-1000 for the same. They are pursuing actively for receiving BMC and the members in general are happy with the support received from the staff and mainly the secretary.

The board members and chairman are to a large extent not involved in routine functioning and handling the issues of the DCS. The secretary mostly manages the DCS with minimal intervention by the Chairman and the board members. Thus, the DCS to a large extent is functioning on individual drive rather than strong governance.

Case study on Dolowal Dairy Cooperative Society

Dolowal (Defunct)

Dolowal falls under the Ropar district and is around 40 Kms from Ropar. The DCS was started in 1998 and started receiving support in 2014. There are 90 households in the village. However, it stopped functioning and became defunct in May 2018. On the request of the members, District Milk Union restarted the DCS during the last quarter of 2018.

In 2017, the DCS had 45 members which reduced to around 15 in March 2018. Currently they have around 20 members and are collecting around 250 liter per day of milk. Current secretary and chairman are putting efforts to revive and bring back the members. The members who supplied more than 50 liters per day have also not returned. They are currently supplying milk to private dairies even though they are not comfortable in supplying to the private dairies.

The DCS became defunct as the previous secretary stopped making payments and sold the assets of the DCS. Over the period, members stopped supplying milk and left the DCS. The board members and the previous chairman were not active and hence they allowed this to continue. In case of strong governance, this would not have been possible. It is again a case of an individual taking advantage of inactive board members and weak governance.

Reference

Charnes, A., Cooper, W.W. and Rhodes, E., 1978. Measuring the efficiency of decision making units. European journal of operational research, 2(6), pp.429-444.

Benos T., Kalogeras N., Verhees F. J., Sergaki P. and Pennings J. M., 2016, 'Cooperatives' organizational restructuring, strategic attributes, and performance: The case of agribusiness cooperatives in Greece', Agribusiness, 32, 127–150.

International Co-Operative Alliance, 2017, Blueprint for a Cooperative Decade, International Co-operative Alliance, Brussels.

National Dairy Development Board, 2018. 2017-18 Annual Report

National Dairy Development Board, 2017. 2016-17 Annual Report.

Nddb.coop.,2018, Manual and Guidelines for Sub Project Implementation / *NDPI*. [online] Available at: https://www.nddb.coop/ndpi/about/manuals/spi [Accessed 8 Oct. 2018].

Sidhu, J.S and Sidhu, R.S., 1990, Case Studies of Successful & Unsuccessful Primary Cooperative Service Society & Milk Producers Cooperative Society in Punjab, Indian Journal of Agricultural Economics, 45 (3), 367-373.