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EXECUTIVE SUMMARY

Future projections show that by 2025, the demand for dairy products in developing countries will increase by 25 percent due to population growth, urbanization and increased incomes. This increase in demand offers a unique opportunity for smallholder dairy farmers, who may achieve higher levels of income and well-being if they are able to increase their milk production. Currently, smallholder dairy producers in developing countries face severe constraints caused by low productivity, lack of market access and high transaction costs. Hence, investments in dairy production that aim to overcome these constraints can serve as a powerful tool for poverty reduction and rural development. Many donors have already invested in reducing poverty by stimulating growth of dairy sector, but the success of such development projects has been variable and largely dependent on local circumstances. India is a good example of the challenges faced by the promotion of dairy development. Remarkable growth in the dairy sector has been achieved by “Operation Flood”, a large-scale government-funded program to promote smallholder dairy production and market integration. However, growth in the dairy sector was not equally distributed among the different regions of India. Moreover, depending on the region, marginalized farmers, including female farmers, still face barriers to access technological innovations (e.g., breed improvement and better feeding practices) as well as access to institutions (e.g., credit and markets). Therefore, India presents a good case for a comparative study that aims to identify what types of institutional arrangements are most suitable to promote inclusive growth of the dairy sector, depending on local circumstances.

Against this background, it is the main objective of this thesis to analyze institutional arrangements for inclusive dairy sector development and to explore the factors that influence or hinder inclusive growth, using India as a case study country. The focus is placed on institutional arrangements that have the potential to address governance challenges and gender inequality in dairy development. Data for this thesis was collected in three Indian states that differ with regard to the overall governance conditions: Telangana, which enjoys favorable governance conditions, Bihar, which can be classified as intermediate, and Uttarakhand, a state with rather unfavorable governance conditions.

The thesis is composed of five chapters. Following an introductory chapter, Chapter 2 explores the governance challenges that different institutional arrangements of dairy marketing pose for inclusive growth. Chapter 3 focuses on the barriers faced by women to participate in institutional arrangements for dairy marketing and to access and control the income derived from dairy production. Chapter 4 presents a case study of the MilkIT project, an internationally funded project that used the institutional arrangement of the “Innovation Platform” to promote dairy development. Chapter 5 discusses the overall findings of the thesis in a comparative perspective and identifies the success factors, which influence inclusive growth of the dairy sector. The final chapter also presents policy recommendations for inclusive dairy development.

The institutional arrangements for dairy marketing that were examined in Bihar and Telangana include different types of dairy cooperatives (with mixed membership and women-only membership), a private dairy company and informal marketing arrangements. A qualitative research approach using Grounded Theory was applied to identify the factors that influence participation of women and marginalized groups in different institutional arrangements. The researcher stayed for two weeks in each of the selected villages and collected data using participant observation as well as other research tools: semi-structured interviews, focus group discussions and the application of Net-Map, a participatory mapping technique.

In Uttarakhand, data from a baseline household survey and focus group discussions conducted for the MilkIT project were compared with a post-intervention household survey to assess the impact of Innovation Platforms on institutional and technological innovations. Furthermore, the documentation of meetings held in the context of the Innovation Platforms was analyzed.

The findings of the study underline that gender inequality and governance challenges are major constraints to achieving inclusive growth, which require context-specific interventions. In Telangana, dairy cooperatives that have only women as members proved to be an appropriate institutional arrangement for inclusive dairy development. These women-only cooperatives performed better than cooperatives with mixed membership. The study showed that women and lower caste producers were often not able to participate in cooperatives with mixed membership, and those who participated had limited access to leadership roles and training opportunities. The results for Bihar were rather different, which underlines the need for a context-specific approach. Women-only cooperatives allowed females and low-caste members to participate, but all leadership roles were occupied by men who dominated the management of those cooperatives. As in Telangana, the mixed dairy cooperative in Bihar were not fully inclusive, but those women and low caste members who were able to join benefitted relatively more from access to inputs and training as was the case in Telangana. Exclusion of women and marginalized groups was particularly evident in the case of a private dairy company in Telangana, which mainly focused on marketing of milk and did not engage in services for productivity enhancement. Informal dairy market arrangements were found to be easily accessible for women and marginalized groups, but they did not facilitate access to inputs and services either. The Innovation Platform approach was found to be effective in facilitating market access and promoting technical innovations. By design and in practice, women were given a chance to participate in this approach not only by attending meetings but also by participating in decision-making.

The study demonstrates that both the institutional set-up and the prevailing governance processes are key aspects of institutional arrangements for inclusive dairy development. Success factors include decentralized governance structures; low state interference; participation of women not only at the village level, but also higher levels of the cooperative arrangement (union or federation level); democratic practices, especially transparency, in the election of leaders; and involvement of all types of members in decision making. Effectiveness and inclusiveness in the provision of economic services also mattered, most notably with regard to input supply and support services to all members. The type of institutional arrangements required to realize these success factors may differ across regions, as the comparison of Telangana and Bihar shows.

Overall, the study suggests that performing a context-specific social and gender analysis is essential for the design of formal institutional arrangements for dairy markets, a finding that likely applies to all agricultural markets. The study clearly shows that creating organizations with women-only membership is not a sufficient condition to promote inclusive agricultural development. What matters is women's participation in leadership position of agricultural marketing organizations (which may require quotas), capacity building, networking through self-help groups and extension services that are accessible to women. The study also shows that innovative institutional arrangements, such as Innovation Platforms, also have a promising potential to foster inclusive agricultural development.

ZUSAMMENFASSUNG

Prognosen für die nähere Zukunft sagen voraus, dass bis zum Jahr 2025 die Nachfrage nach Milchprodukten in Entwicklungsländern aufgrund von Bevölkerungswachstum, Verstädterung und wachsendem Einkommen um 25 Prozent steigen wird. Dieser Nachfrageanstieg bietet eine einzigartige Chance für kleinbäuerliche Milchbauern, höhere Einkommen und mehr Wohlstand durch die Steigerung der Milchproduktion zu erlangen. Gegenwärtig sehen sich kleinbäuerliche Milcherzeuger in Entwicklungsländern durch niedrige Produktivität, mangelnden Marktzugang und hohe Transaktionskosten erheblichen Einschränkungen ausgesetzt. Investitionen in die Milcherzeugung, die darauf abzielen, diese Beschränkungen zu überwinden, können ein wirksames Instrument zur Armutsbekämpfung und zur Entwicklung des ländlichen Raums sein. Viele Entwicklungsorganisationen haben bereits in die Verringerung der Armut investiert, indem sie das Wachstum des Milchsektors gefördert haben. Der Erfolg solcher Entwicklungsprojekte war unterschiedlich und hängt weitgehend von den lokalen Gegebenheiten ab. Indien ist ein gutes Beispiel für die Herausforderungen, die bei der Förderung der Entwicklung des Milchsektors überwunden werden müssen. So wurde ein beachtliches Wachstum von Milchproduktion und -vermarktung durch "Operation Flood" erreicht, ein großangelegtes staatlich finanziertes Programm zur Förderung der kleinbäuerlichen Milchproduktion und -vermarktung. Das erzielte Wachstum im Milchsektor war jedoch nicht gleichmäßig auf die verschiedenen Regionen Indiens verteilt. Darüber hinaus sind marginalisierte Landwirtinnen und Landwirte, abhängig von der Region, weiterhin Hindernissen beim Zugang zu technologischen Innovationen (z. B. Verbesserung des genetischen Potentials und bessere Fütterungspraktiken) und zu Institutionen (z. B. Kredite und Märkte) ausgesetzt. Indien ist somit ein geeignetes Land für eine Vergleichsstudie, die darauf abzielt zu ermitteln, welche Formen institutioneller Rahmenbedingungen und Strukturen am besten geeignet sind, ein integratives Wachstum des Milchsektors zu fördern, abhängig von den örtlichen Gegebenheiten.

Vor diesem Hintergrund ist es das Hauptziel dieser Arbeit, institutionelle Strukturen und Vereinbarungen für eine integrative Entwicklung des Milchsektors zu analysieren und die Faktoren zu untersuchen, die das inklusive Wachstum des Sektors in Indien positive oder negativ beeinflussen. Der Schwerpunkt liegt auf institutionellen Strukturen und Vereinbarungen, die das Potenzial haben, Governance-Probleme und Ungleichheiten zwischen den Geschlechtern bei der Entwicklung des Milchsektors zu beheben. Die Daten für diese Arbeit wurden in drei indischen Bundesstaaten erhoben, die sich hinsichtlich der allgemeinen Governance-Bedingungen unterscheiden: Telangana, das günstige Rahmenbedingungen hinsichtlich Governance genießt; Bihar, das als intermediär eingestuft werden kann; und Uttarakhand, ein Staat mit eher ungünstigen Bedingungen.

Die Arbeit besteht aus fünf Kapiteln. Nach einem einleitenden Kapitel untersucht Kapitel 2 die Governance-Herausforderungen, die sich aus unterschiedlichen institutionellen Strukturen und Vereinbarungen im Milchsektor für inklusives Wachstum ergeben. Kapitel 3 konzentriert sich auf die Barrieren, die Frauen überwinden müssen, um sich unter verschiedenen institutionellen Bedingungen an der Milchvermarktung zu beteiligen und Zugang und Kontrolle über das Einkommen aus der Milchproduktion zu erhalten. Kapitel 4 präsentiert eine Fallstudie zum MilkIT Projekt, einem international finanzierten Projekt, das das institutionelle Instrument der *Innovationsplattform* zur Förderung der Milchproduktion und -vermarktung nutzte. Kapitel 5 vergleicht und diskutiert die Gesamtergebnisse der Arbeit und identifiziert die Erfolgsfaktoren, die integratives Wachstum im Milchsektor unterstützen. Das

letzte Kapitel enthält schließlich politische Empfehlungen für die integrative Entwicklung des Milchsektors.

Die institutionelle Struktur der Milchvermarktung, die in Bihar und Telangana untersucht wurden, umfasst verschiedene Arten von Molkereigenossenschaften (mit gemischter Mitgliedschaft und mit ausschließlich weiblicher Mitgliedschaft), eine private Molkereigesellschaft und informelle Vermarktungsvereinbarungen. Ein qualitativer Forschungsansatz unter Verwendung der *Grounded Theory* wurde angewendet, um die Faktoren zu identifizieren, die die Partizipation von Frauen und marginalisierten Gruppen in verschiedenen Institutionen beeinflussen. Ein Forschungsaufenthalt von jeweils zwei Wochen in jedem der ausgewählten Dörfer wurde genutzt, um Daten mit Hilfe von Teilnehmerbeobachtungen und anderen Rechercheinstrumenten (semistrukturierte Interviews, Fokusgruppendifkussionen und die Anwendung von Net-Map, einer partizipativen Kartierungstechnik) zu sammeln.

In Uttarakhand wurden Daten aus einer Haushaltsgrunderhebung und von Fokusgruppendifkussionen für das MilkIT-Projekt mit einer Haushaltsumfrage nach der Intervention verglichen, um die Auswirkungen von *Innovationsplattformen* auf institutionelle und technologische Innovationen zu bewerten. Darüber hinaus wurde die Dokumentation von Treffen im Rahmen der *Innovationsplattform* analysiert.

Die Ergebnisse der Studie unterstreichen, dass geschlechtsspezifische Ungleichheit und Governance-Herausforderungen wesentliche Hindernisse für integratives Wachstum darstellen, die kontextspezifische Interventionen erfordern. In Telangana erwiesen sich Molkereigenossenschaften, die nur Frauen als Mitglieder haben, als ein geeignetes institutionelles Format für die integrative Entwicklung des Milchsektors. Die Genossenschaften mit weiblicher Mitgliedschaft zeigten bessere Ergebnisse als Genossenschaften mit gemischter Mitgliedschaft. Die Studie zeigte, dass Frauen und Produzenten von niedrigeren Kasten oft nicht in der Lage waren, sich aktiv an Genossenschaften mit gemischter Mitgliedschaft zu beteiligen; solche Mitglieder hatten nur begrenzten Zugang zu Führungsrollen und Ausbildungsmöglichkeiten. Die Ergebnisse aus Bihar waren nicht so eindeutig, was die Notwendigkeit eines kontextspezifischen Ansatzes nochmals unterstreicht. Genossenschaften, die nur Frauen vorbehalten waren, erlaubten auch unteren Kasten sich zu beteiligen. Trotzdem wurden alle Führungsrollen von Männern besetzt, die das Management dieser Genossenschaften beherrschten. Wie in Telangana war die gemischte Molkereigenossenschaft in Bihar nicht vollständig inklusiv. Allerdings profitieren Frauen und Mitglieder der niedrigen Kaste, die in der Lage waren beizutreten, relativ stärker vom Zugang zu Ausstattung und Ausbildung, als es in Telangana der Fall war. Der Ausschluss von Frauen und marginalisierten Gruppen wurde besonders deutlich bei einem privaten Molkereiunternehmen in Telangana, das sich hauptsächlich auf die Vermarktung von Milch konzentrierte und keine Dienstleistungen zur Produktivitätssteigerung der Produzenten anbot. Andererseits zeigte es sich, dass informelle Strukturen in der Milchvermarktung für Frauen und Randgruppen leicht zugänglich waren, allerdings ohne den Zugang zu Betriebsmitteln und Dienstleistungen zu erleichtern. Es wurde festgestellt, dass der Ansatz der *Innovationsplattform* den Marktzugang erleichtert und die Verbreitung von technischen Innovationen fördert. In der Praxis erhielten Frauen hier die Chance, sich aktiv zu beteiligen, und zwar nicht nur durch die Teilnahme an Sitzungen, sondern auch durch ihre Beiträge zu Entscheidungsprozessen.

Die Studie zeigt, dass sowohl institutionelle Strukturen als auch die vorherrschenden Governance-Prozesse Schlüsselaspekte institutioneller Bestimmungen für die integrative Milchentwicklung sind. Erfolgsfaktoren sind dezentrale Governance-Strukturen; geringe

staatliche Einmischung; Beteiligung von Frauen nicht nur auf dörflicher Ebene, sondern auch auf höheren Ebenen der genossenschaftlichen Organisation (Gewerkschafts- oder Verbandsebene); demokratische Praktiken, insbesondere Transparenz bei der Besetzung von Führungspositionen; und Einbeziehung aller Arten von Mitgliedern in die Entscheidungsfindung. Auch bei der Bereitstellung wirtschaftlicher Dienstleistungen spielten Effizienz und Inklusivität eine wichtige Rolle, insbesondere im Hinblick auf die Betriebsmittelbereitstellung und Dienstleistungen für alle Mitglieder. Die Art der institutionellen Strukturen, die zur Realisierung dieser Erfolgsfaktoren erforderlich ist, kann regional unterschiedlich sein, wie der Vergleich von Telangana und Bihar zeigt.

Insgesamt legt die Studie nahe, dass die Durchführung einer kontextspezifischen Analyse der sozialen und geschlechtsspezifischen Aspekte bei der Gestaltung formeller institutioneller Strukturen für die inklusive Entwicklung des Milchsektors von wesentlicher Bedeutung ist, was wahrscheinlich auch für andere Agrarsektoren gilt. Die Studie zeigt deutlich, dass die Schaffung von Organisationen, die ausschließlich Frauen aufnimmt, keine hinreichende Voraussetzung für die Förderung einer integrativen Entwicklung ist. Was zählt, ist die hinreichende Repräsentation von Frauen in Führungspositionen von Vermarktungsorganisationen (wozu Quoten erforderlich sein könnten), die Stärkung von sozialen und technischen Fähigkeiten und eine Vernetzung von Produzenten durch Selbsthilfegruppen und Beratungsdienste, die für Frauen zugänglich sind. Die Studie zeigt auch, dass innovative institutionelle Formate wie *Innovationsplattformen* ein vielversprechendes Potenzial zur Förderung einer integrativen Agrarentwicklung haben.

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LIST OF ACRONYMS AND ABBREVIATIONS

AI	Artificial Insemination
AMUL	Anand Milk Union Limited
ANOVA	Analysis of Variance
AP	Andhra Pradesh
ATM	All-time Money
BC	Backward Caste
B-Co-op	Bihar dairy Cooperative
Bih-MixDC	Bihar Mixed Dairy Cooperative
Bih-WomDC	Bihar Women Dairy Cooperative
B-informal	Bihar informal
BOD	Board of Directors
CGIAR	Consultative Group on International Agricultural Research
CHIRAG	Central Himalayan Rural Action Group
CRP	Core Research Proposal
Devt	Development
DF	Degrees of Freedom
Dist	District
DRDA	District Rural Development Agency
EU	European Union
FAO	Food and Agriculture Organization
FC	Forward Caste
FEAST	Feed Assessment Tool
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GM	General Manager
GoI	Government of India
IAS	Indian Administrative Services
IFAD	International Fund for Agricultural Development
IFCN	International Farm Comparison Network
ILRI	International Livestock Research Institute
ILSP	Integrated Livelihood Support Programme
INHERE	Institute of Himalayan Environment Research Education
IP	Innovation Platform
KVK	Krishi Vigyan Kendra
MD	Managing Director
MilkIT	Milk India and Tanzania
MMPO	Milk and Milk Products Order
MMPR	Milk and Milk Products Amendments Regulations
n	Number
NABARD	National Bank for Agriculture and Rural Development

NDDB	National Dairy Development Board
NDP	National Dairy Plan
NGO	Non-Government Organization
NSSO	National Statistics Services Organization
SC	Scheduled Caste
SHG	Self-Help Group
ST	Scheduled Tribes
T-Co-op	Telangana dairy Cooperative
Tel-MixDC	Telangana Mixed Dairy Cooperative
Tel-WomDC	Telangana Women Dairy Cooperative
T-private	Telangana private
UNICEF	United Nations International Children's Education Fund
US	United States
USD	United States Dollar
USDA	United States Department of Agriculture

1 Introduction

1.1 Problem statement

Smallholder dairy production is dominant in many parts of the developing world because it is an important source of animal protein and livelihood to millions of the world's poorest people. In the dairy sector, milk and milk based products are important sources of dietary energy, protein and fat. It helps to combat malnutrition in developing countries where the poorest lack diversity in their diet and depend largely on cereals (FAO 2013). Future projections show that by 2025, demand for animal sourced foods especially dairy products will increase by 25 percent in developing countries due to fast urbanization, increased income and population growth (IFCN 2016).

Globally, in the last 10 years, demand for milk has increased by 26% or annually by 2.4% (IFCN 2016). According to the FAO and IFCN estimations, almost 120 million farm households in the whole world are involved in dairy production. Milk production is increasing due to high demand in developing countries where annual growth rates in milk consumption averaged 3.5 to 4.0 percent (Hemme and Otte 2010; IFCN 2016). This consumption trend for milk and milk products is double the growth rates of major cereal foods. This increasing consumption trend for milk indicate that investment in dairy sector growth could serve as a powerful strategy for reducing poverty if properly implemented. As women are playing a key role in dairy production, the benefits will support women's empowerment and household welfare in the long run.

The increasing demand of milk products is a good opportunity for the poorest sections of communities from developing countries to reap benefits. These smallholders have an advantage comparatively over developed countries due to low production costs, as they use family labour and farm crop residues for feeding the dairy animals. Furthermore, there are also additional environmental benefits because animal manure is used as the main source of nutrients instead of chemical fertilizers. However, smallholder dairy producers in developing countries face severe constraints such as poor productivity, a lack of markets and high transaction costs due to poor economies of scale. Milk is highly perishable in nature, and therefore needs an immediate market to sell the products, or processing which connects producers to consumers.

Market development is an important engine for pro-poor development and poverty alleviation (Dorward 2006). Smallholders in developing countries face severe constraints to reach the market due to lack of information and high transaction costs. “Making institutions right” was the aim of development actors in 1990s to address poverty issues in developing countries. Collective action through cooperatives is one of the many ways for these smallholders to reduce the transaction costs and enable them to access the market and urban consumers. But there are mixed results in different countries for dairy production growth. For example, EU-25 (mainly Germany and France) and South Asia (mainly India, Pakistan) are the major regions for global dairy production, which accounts for 44% of milk production (Hemme and Otte 2010). Despite the fact that 10% of the global cattle population is in Africa, its contribution to global milk production is only 3%, and this region is highly dependent on the import of milk from the EU region. It is important to explore the institutional arrangements for market development to find out the factors which influence or hinder the growth.

1.2 India as a case study

India serves as an example as the biggest dairy development programme through a dairy cooperative movement. Dairy cooperatives have emerged as the largest rural development scheme in India in the 1970s to 1990s along with investment from many donors as well as policy support which are given in following Table 1-1. These supportive policies and investments enabled the modernization of the dairy sector to a level from where it can take off to meet not only the country’s demand for milk and milk products but can also exploit global market opportunities (Rajendran and Mohanty 2004). Milk and dairy products in India contribute to 9 and 13 percent of dietary nutrition for rural and for urban populations respectively (Ohlan 2012a, 2012b). In India, almost one third of Indians, especially from northern states, follow lacto-vegetarianism, where milk and milk products are an important source of dietary protein (Devi et al. 2014).

India continues to be the largest producer of milk, with a growth rate of 4.2% for the last two decades (USDA 2017). Several institutional innovations have been initiated by the government of India to increase the productivity of dairy animals, to improve processing infrastructure and to encourage the private investments for processing and productivity through organized marketing channels. The above initiatives have greatly increased milk production from 55 million tons in 1990 to 165 million tons in 2016-17, and per capita availability of 178 grams/day in 1990 to 355 grams/day in 2016 (Figure 1-1) (NDDB 2016).

Some of the key institutional innovations and policy measures from the 1950s are listed in the following Table 1-1.

Table 1-1 Institutional and policy innovations in India for dairy development

Year	Details of institutional innovation/policies	Key features/functions
1950	Milk sub-committee of the policy committee on Agriculture	City milk scheme originated to promote peri-urban dairy farms and city milk control board
1948	Kaira District Cooperative Milk producers union (Anand Milk Union Limited-AMUL)	Farmers organized themselves as a dairy cooperative and supplied milk in Bombay
1965	National Dairy Development Board (NDDB)	Apex body to promote, finance and support producer owned dairy organizations Launched Operation Flood programme to scale up AMUL model of dairy cooperatives
1970	National Cooperative Dairy Federation of India	To promote the dairy and oilseed industries as well as cooperative lines
1970-80	Operation Flood-I	Aimed at organizing dairy cooperatives at the village level, infrastructure development for processing and marketing and production enhancement services at village and union level. Established city dairies in ten states
1981-85	Operation Flood-II	Concentrated mainly in Karnataka, Rajasthan and Madhya Pradesh to establish necessary infrastructure to support the dairy industry
1985-96	Operation Flood-III	Enhance productivity and strengthen the institutional base for cooperative efficiency with long term sustainability
1990s	Women only dairy cooperative society	Women only dairy cooperatives were implemented in a few villages to encourage more women to become members
1992	Milk and Milk Products Order (MMPO)	No license is required to establish a dairy processing plant in India up to 10000 litres per day, only memorandum to be submitted to industry approval. Certification of registration required
1995	Andhra Pradesh Mutually Aided Cooperative Societies Act (APMAS Act)	The act facilitates the formation of voluntary dairy cooperatives by producers with no interference from the government
2003	Producer Company Act (New Generation Cooperatives)	Amendment in company act 1956 to promote hybrid form between private dairy company and dairy cooperative. This is promoted by NGOs with minimum 10 members
2009	Milk and Milk Products Amendments Regulations (MMPR-09)	Any person/dairy plant handling more than 10,000 litres per day of milk needs to be registered with the Registering Authority appointed by the Central Government
2015	White Revolution II National Dairy Plan-NDP (Mission Milk)	This world bank funded project aimed to double milk production by 2022

Source: compiled by researcher from different documents and reports

Dairy cooperative movements through Operation Flood from 1970-1996 were key institutional measures for fast dairy growth. MMPO Act 1996 and MMPR-09 relaxed rules

and regulations which encouraged private sector investment in dairy development. Some more institutional innovations within cooperatives like mutually aided cooperatives and producer company encouraged producers to obtain autonomy from public interference (Figure 1-1). The value of milk output from the overall livestock sector is INR 549587 crores, which is 801.5 billion US dollars (NDDB 2016).

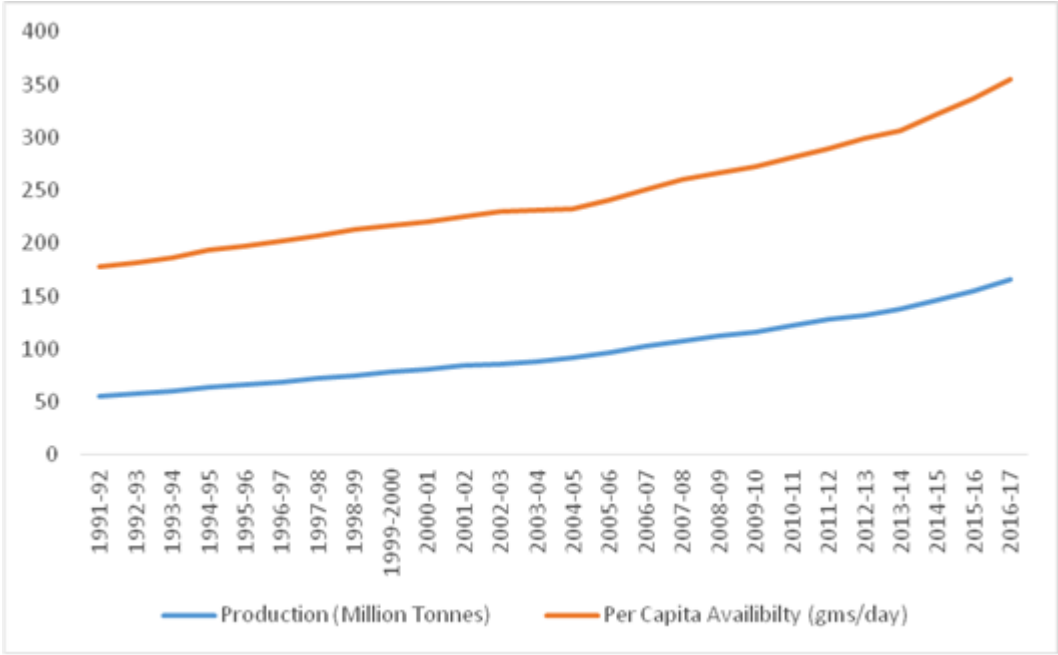


Figure 1-1 Production and Per Capita availability of milk India (1991-2017)

Source: Department of animal husbandry, dairying and fisheries, Government of India, 2016-17. Accessed from <http://dahd.nic.in/reports/annual-report-2016-17>

1.3 Who owns dairy animals in India?

Dairy cooperative movements were not aimed initially for poverty reduction but aimed to increase the growth of the sector (Candler and Kumar 1998). However, this programme had great impact for the marginalized and women. India is predominantly characterized by mixed crop-livestock economy where landless and poor farmers use a combination of family labour, crop residues from their land and free grazing to rear their animals (Deshingkar et al. 2008). Dairying is the major source of rural employment. The income from dairying has an equalizing effect on the income distribution to all categories of producers compared to the distribution of income arising from crop production (Birthal, Taneja, and Thorpe 2006; Mandal, Datta, and Lama 2010). Even though dairy animals are owned by all wealth sections of the community, it acts as an important livelihood asset especially for poorest people. The following table indicates the livestock ownership in India by different land holding

households where 57.67% of bovines or milk animals in India are owned by marginal farmers (Table 1-2).

Table 1-2 Percentage distribution of different livestock species by different category of land holdings in India

Category of operational holding (Land size in ha)	Cattle (%)	Buffalo (%)	Bovine (%)	Sheep (%)	Goat (%)	Pig (%)	Poultry (%)
Landless (<=0.002)	0.01	0.05	0.03	0.00	0.02	0.00	0.03
Marginal (0.002-1.000)	59.76	53.54	57.67	46.06	69.66	62.92	66.06
Small (1.000-2.000)	20.37	20.59	20.45	18.40	13.77	25.60	21.66
Semi-medium (2.000-4.000)	12.04	16.01	13.38	7.46	8.65	9.88	9.76
Medium (4.000-10.000)	6.39	8.27	7.02	26.76	7.11	1.43	2.40
Large (>10.000)	1.42	1.55	1.46	1.30	0.79	0.10	0.09
All sizes	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Author

Within households, women play a key role in dairy production and contribute approximately 70% of labour, their roles are multi-faceted but are not valued and acknowledged (Basu 2009; Daftary 2015; Patel et al. 2016). Women are typically responsible for collection of fodder from fields, fetching water from distant places, frequent feeding and watering of animals, caring for calves and sick animals, cleaning sheds, making dung cakes etc.

1.4 Does India follow inclusive dairy development?

Even though there is fast growth in dairy production in India, this growth was not equally distributed across different regions and different sections of communities. There are huge differences in production and per capita availability of milk in different regions of India (Ohlan 2012a; Sharma 2004). The per capita availability of milk is low in the Eastern and Southern states whereas it is high in Northern states. The top five states with high milk production are Uttar Pradesh, Punjab, Haryana, Rajasthan and Andhra Pradesh which are also characterized with high proportions of resource endowments and infrastructure.

Several studies have been conducted in the last few decades to evaluate the impact of market interventions through the Operation Flood programme on economic growth and development (Bennett 1991; Candler and Kumar 1998; Parthasarathy 1991). These studies compare the households participating in dairy cooperatives with non-participant households. But there are many poor households and women who are reluctant to participate in dairy cooperatives due to various issues (e.g. social barriers, access to cooperatives) at different levels. One side of these reviews reveal positive results: that dairy cooperatives helped marginal farmers to participate in dairy cooperatives which in turn helped ensure the well-being of families

(Candler and Kumar 1998; Mitra, 990). In the same line of study conducted by the FAO, it was indicated that the income of people without land ownership has been doubled with the Operation Flood program (Cunningham 2009). On the other hand, a review by Parthasarathy concluded that landless, marginal and small farmers didn't get much benefit from operation flood due to a fodder and credit barrier, and poor social status such as low caste (Parthasarathy 1991). A recent study has reported that growth in herd size and graded dairy cattle is polarized towards large farmers and high caste communities due to discrimination of dairy cooperatives towards marginalized and low caste communities (Squicciarini et al. 2017). Apart from marginalized communities, women also face discrimination to access to the benefits from the dairy development.

Even though many innovative policies emerged in India to benefit women during the cooperative movement, it has been observed that this movement has a negative impact on women's livelihood. For example, literature shows that their contribution as labour increased whereas access to income decreased compared to the pre-cooperative setting (Bennett 1991). This is due to a lack of participation by women in dairy cooperatives. Women have less access to cooperative membership when it is a mixed membership, because membership is given to the household head which in most cases in India are men (Kaur 2009). Only 18% of women are registered as members in dairy cooperatives in India (Gupta 2000). Women often face greater barriers than men to gain access to inputs and services to improve productivity, which limit their ability to move from subsistence production to commercial production (World Bank; FAO; IFAD 2009; World Bank 2011). Another issue in dairy cooperative movements in India is that women are often under-represented in management and leadership roles. For example, only 3 percent of women were represented in a board (Bennett 1991; Cunningham 2009; Gupta 2000).

There is a dearth of empirically grounded research, which explores the dynamics of issues faced by women and the poorest of the population in gaining access to these dairy market channel arrangements. The overall aim of this thesis is to understand and explore the problem of governance challenges and gender inequality in the participation of the poor and women in different institutional arrangements for dairy market development.

1.5 Knowledge gap

From the above literature a knowledge gap exists regarding dairy development and inclusive growth in India, especially in the case of the marginalized and women. Most of the work

described in the above section about the impacts of operation flood and dairy cooperative movements was conducted in the 1980s and 1990s. There were many institutional innovations that emerged later in the 2000s to encourage women's participation. However, there is a lack of information on the influence of institutional arrangements and governance processes on women and marginalized communities to benefit from dairy development and reduce poverty. There is a lack of knowledge on how to increase representation of women and the marginalized in market participation. No empirical evidence to compare different institutional arrangements is available. There are no peer reviewed articles available to evaluate the impact of institutional arrangements for inclusive dairy market development.

This thesis derives its motivation from the above mentioned gaps in knowledge and contributes to overall inclusive market development through in-depth analysis of three elements: 1) Governance challenges in institutional arrangements for dairy market development; 2) Gender issues restraining women's participation in market channels; 3) Role of an innovation platform for participation and market institutional development.

1.6 Objectives of the thesis

The thesis has three main objectives

1. To evaluate and compare the different dairy market institutional arrangements for governance challenges and their impact on dairy income
2. To explore the factors that determine women's participation in dairy cooperative membership and control over dairy income
3. To assess the impact of an innovation platform approach for increasing dairy productivity and market innovations

1.7 Conceptual framework: Institutional arrangements for inclusive dairy market growth

1.7.1 Inclusive market growth

Growth is inclusive when the institutional arrangements allow all individuals of a society to participate and contribute to the growth processes on an equal basis regardless of their individual socio-economic status (Ali and Zhuang 2007). In this study, inclusive growth considers inclusion of the marginalized and women for achieving equitable development. As shown in Figure 1-2 inclusive growth is the final outcome of the analysis. Poverty, inequality and growth are interlinked with each other and cause direct and indirect effects (Naschold

2002). Fast economic growth without including all sections of the society could result in a huge gap between the rich and poor and, create conflicts and civil war which increases the poverty level. Knee jerk reactions just to eliminate inequalities may slow growth process (Ali 2007).

1.7.2 Outcome of institutional arrangement: productivity increase and market integration

The analysis framework (Figure 1-2) has taken two outcome aspects from institutional arrangements for inclusive dairy market development, which include productivity increase and market integration. These outcomes of market integration and productivity enhancement from cooperatives are aligned with the concepts of Poole and Frece for economic and social inclusion (Poole and Frece 2010). Market engagement and performance are considered as economic inclusion and empowerment, participation, capacity development and democratic governance are considered as social inclusion. Countries differ in productivity achievement. For example, developed countries have high productivity in agriculture and livestock production. Productivity enhancement is the main driver in developing countries for increasing income and economic growth (Hall and Jones 1999). There are differences in the performance of households for increasing agricultural productivity, which is based on the social infrastructure (institutions and policies) where they live.

In the last few decades, market integration is getting attention in developing countries. However, the opportunity for smallholder farmers to increase their income from agriculture production and rural enterprises depends upon market participation to sell their products and gain access to inputs and services. Access to urban markets by smallholders to sell their products will increase their profits. However, smallholders face severe challenges to participate in these high value markets. These challenges include market imperfection, lack of information on prices and technologies, lack of credit facility and high transaction costs. Institutional arrangements are important aspect to solve these constraints. Collective action through cooperatives in developing countries helps to decrease the transaction cost and increase access to markets for agriculture production and natural resource management (Markelova et al. 2009). Sometimes market institutions favor the large farmers due to economies of scale leaving small farmers in subsistence farming. Market integration and productivity increase are interlinked with each other. When there is incentive to increase productivity through a better market, farmers invest in inputs and services to increase

productivity (Ravichandran, Teufel, and Duncan 2016). This is the other way around when there are surpluses productive farmers will find a better market to better increase their income.

1.7.3 Type of institutional arrangements

Institutions are defined as the ‘rules of the game’ which facilitate human interactions (North 1990). According to North, Institutions comprise of formal (laws, contracts, markets) and informal (norms, traditions, customs, value systems, sociological trends) rules to conduct and facilitate transactions between, or govern economic decisions within, organizations. In this study different types of institutional arrangements for example informal organizations (traders, neighbours) and formal organizations (cooperatives, producer company, private company) are included for analysis to see their impact in inclusive growth. Institutions matter for growth and poverty reduction but should be supported by economic, social and political institutions (Leftwich and Sen 2011). Institutional structures and governance processes followed in these institutional arrangements will greatly influence inclusive growth. The conceptual framework (Figure 1-2) argues that sound institutional arrangements and good governance have direct impacts on inclusive growth and performance (Chibanda et al., 2009). Furthermore, governance structures and policies are also important to achieve the inclusive growth.

Outcome: inclusive growth facilitate development

Type of institutions

Governance

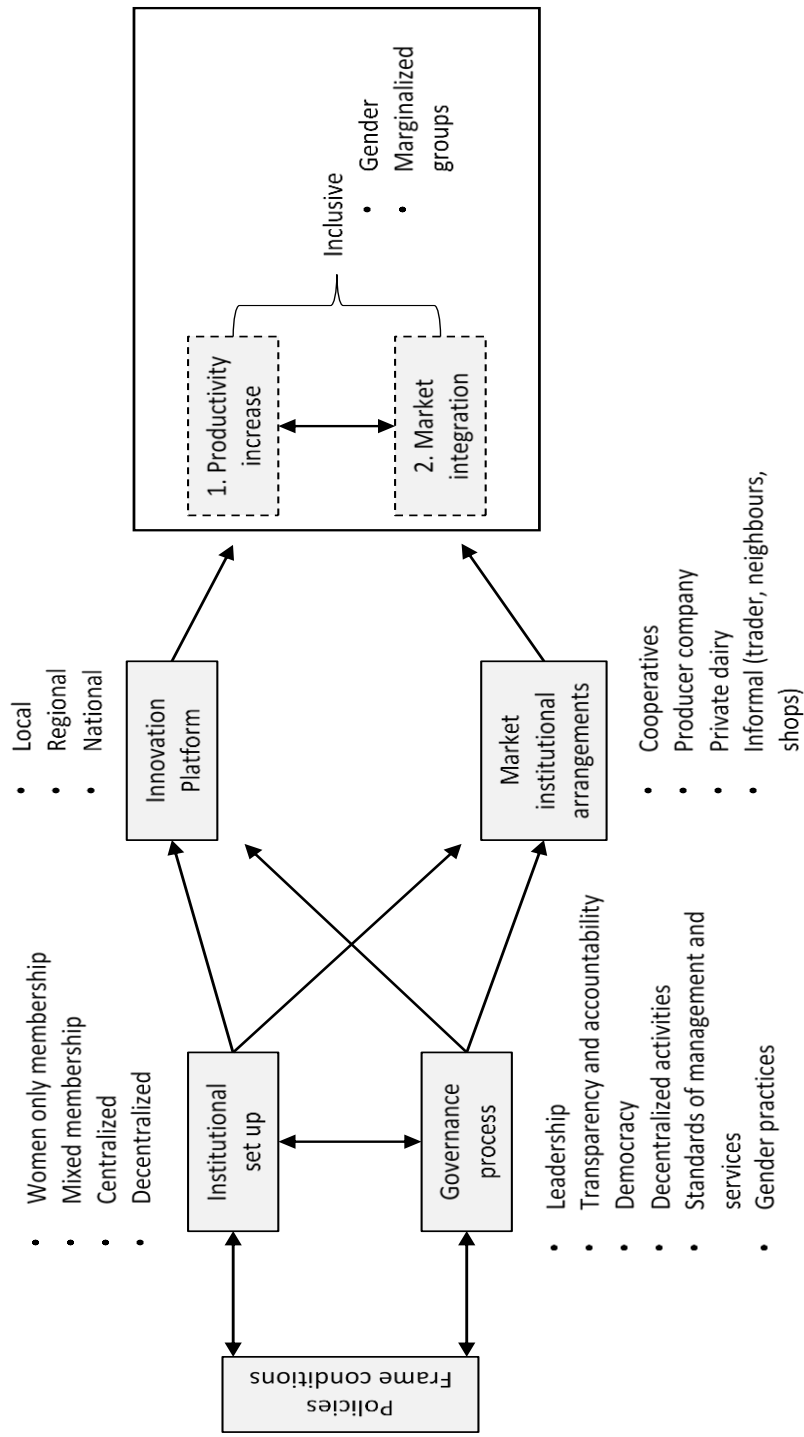


Figure 1-2 Framework for comparison of market institutions for inclusive development

Source: Author

Innovation platforms as a catalyst for growth: The majority of smallholders are facing struggles to transform from subsistence production to commercial production due to high transaction costs, lack of access to inputs and services and a lack of participation in high value markets (Poulton, Kydd, and Dorward 2006). Many development actors and donors are facilitating the rise of collective action which facilitates the participation of small holders in the market (Markelova et al. 2009; Poulton, Dorward, and Kydd 2010). However, these efforts are not delivering positive results in some regions due to intrinsic social and political issues which require innovative approaches. Apart from this collective action there is a need for networking and linkage of producers with non-producers (development and private actors) to solve market imperfections and productivity issues which otherwise hinder growth. An innovation platform (IP) is a virtual or physical space for learning and change where different stakeholders including farmers, private players, government officials and extension agents connect together to diagnose and address common issues and bring innovations in technology, institutions and capacity building (Homann-Kee Tui et al. 2013). This part of innovation has also been included in this framework to test how the innovation platforms at local levels are supporting inclusive market developments and productivity increases for smallholders.

1.7.4 Governance: Institutional set-up and governance process

Good governance is defined by the United Nations Development Programme, which advocates integration of the poorest and marginalized people in making decisions about allocating development resources (World Bank; FAO; IFAD 2009). A growing literature defines governance as the process whereby societies or organizations determine how power is exercised, whom they involve in decision making and how they render accountability within the organizations (Graham, Amos, and Plumptre 2003; Saner and Wilson 2003). Governance processes are important for achieving inclusive growth. In this study, governance is examined in two aspects: one is governance structures or institutional set ups and the other is governance process within institutional arrangements for decision making processes and implementation. Governance processes in this study are measured by how institutional arrangements are following democratic practices, transparency, accountability, standards of management and services to members, which facilitate all sections of society to participate equally. Strong institutional arrangements and good governance promotes an organization's performance (North 1990), which reach to all sections of society. This study explores the practices which encourage women's participation to achieve gender equity. Two aspects of institutional set ups for formal market arrangements were examined in this study, which

include women only membership and mixed membership set ups. Most of the institutional arrangements in developing countries are linked with poor governance, which lead to increased inequality due to elite capture and political lobbying (Birner 2010). Poor governance in developing countries is a predetermining factor for the lack of inclusive growth, which subsequently reduces farm income and increases poverty (Bernard and Spielman 2009; Singh 2015). Governance is one element in policy implementation. In some cases, the introduction of good policies fails to achieve inclusive growth if there is poor governance in the implementation of policies. Sometimes safety nets (social protection policies or measures) are needed to include the disadvantaged in order to ensure benefits from development.

1.8 Research design and components

1.8.1 Grounded theory approach

This study was focused on developing theories and concepts around factors which facilitate, influence or hinder the participation of marginalized communities and women in different dairy market channels. The study has adopted qualitative methods using the grounded theory approach (Glaser and Strauss 2009) as there was a dearth of information about the issue of market participation. There was a need for deeper insights regarding the participation of male and female dairy producers to develop concepts and theories about the difficulties they face in institutional arrangements for the enhancement of dairy production and gender issues they face for the participation and access to benefits. In this approach, theories were generated from the data, which was collected based on preconceived hypotheses or open questions. The data were categorized coded to develop theories from these concepts. Theoretical sampling was followed until information saturation was reached. The data were coded after each interview or observation and the researcher continued the data collection till no new information was captured. Here the study primarily concerns how institutional arrangements are functioning to represent women and marginalized communities. A series of case studies were set-up to explore, explain, describe and illustrate the reasons for the behaviour of individuals (Yin, 2003). The factors of participation in the dairy market channels and their effects in the household and community level were collected through these case studies.

1.8.2 Net-maps

Net-maps help the researcher to understand who are the stakeholders, how they are connected and how they influence the participant through visual presentation (Schiffer 2007). The

researcher used two types of Net-maps: one is a Process Net-map, which explains the steps in implementation mechanisms of different dairy market channels, characteristics of actors and any possible leakage points in implementation; the second is an Influence Net-map, which visualizes dairy market channels and their influence on the participant's dairy income and livelihood. This tool allows the researcher to explore the different perspectives of any observed issue and discover major barriers of entry for participant in dairy market channels.

1.8.3 Ethnographic survey

This study has the objective to understand the participant's behaviour in detail as sometimes participants do not report themselves fully. The researcher stayed in selected villages where different dairy market channels are present. Ethnography explores social interactions, behaviour and opinions within team, groups, organizations and communities (Reeves, Kuper, and Hodges 2008). The researcher used both semi-structured interviews and observations for collecting rich, holistic insights into opinions and actions of people as well as enabling an environment in which they can explain their behaviour. After the semi-structured interviews, the researcher observed the participants and their environments to explore possible reasons for a particular behaviour if participants didn't explain themselves. The researcher stayed for two weeks in each dairy market channel selected for this study. The researcher participated in meetings or events in the village during the stay to explore details about social norms associated with the action or behaviour.

1.8.4 Study sites

The study has selected two states Telangana and Bihar in India. This is because both states have variation in dairy market development. Telangana is considered as a leading state with the highest market innovations for dairy development. These market innovations include dairy cooperatives, mutually aided cooperatives, women only dairy cooperatives and a producer company model etc. The state facilitates private investors by providing an environment that enables one to invest in dairy processing and market support. On the other hand, Bihar is an experienced state and dominant player in dairy cooperative intervention and control. There are only few private players for dairy processing as there are restrictive policies for private investment. Both states have different socio-economic characteristics for capturing the variations that may explain the behaviour of a participant. MilkIT project was implemented in Uttarakhand where dairy development is in a rudimentary stage and reported a failure of state dairy cooperatives and a lower dairy productivity than national average.

1.9 Thesis layout

The thesis is arranged into five chapters. Following this introductory chapter, chapter 2 explores the governance challenges in different institutional arrangements for inclusive dairy market growth. Chapter 3 explores the gender issues especially barriers faced by women to participate in dairy cooperatives and control of dairy income and evaluates the benefits/impacts of their participation. Chapter 4 is a case study of MilkIT project, which demonstrates how this local Innovation Platform supports dairy market institutional development and addresses gender issues. The final chapter of this thesis, chapter 5 discusses the overall findings of all three chapters and concludes on the success factors, which influence inclusive growth. The final chapter also draw policy recommendations for inclusive dairy development through market channels.

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2 Comparison of institutional arrangements for dairy governance in Telangana and Bihar

2.1 Abstract

Many policies in India that focus on empowering women economically encourage them to participate in dairy market channels. But there is poor governance in dairy market institutions and women are under-represented in the membership and management of these institutions. This study identified and defined together with 117 women and 87 men the governance challenges of different dairy market channels in India (2 cooperatives with women members only and two with mixed membership; one private dairy company with no membership; and the informal dairy market sector) and options for overcoming them. A qualitative case study approach with help of Net-Maps and semi-structured interviews were followed. Interviews were conducted during an ethnographic stay in villages of Bihar and Telangana. Results showed that in the dairy cooperatives, women-only member dairy cooperatives in Telangana performed better than mixed-member dairy cooperatives in terms of good governance. Women's participation in the vertical organization structure from membership to management and good leadership were the main reasons for better governance there. In Bihar, on the contrary, women-only membership dairy cooperatives had poor governance compared to mixed-membership dairy cooperatives. Respondents argued that the informal dairy market sector was found to be a good market channel for women and the poorest near the urban areas; however, there is a lack of public investment in inputs and service provision. The private dairy company was found to focus on maximizing profit, to exploit the poor through credit services and to exclude women.

Keywords: cooperative, dairy, development, governance, women

2.2 Introduction

In India, government and civil society organizations have emphasized promoting women in collective action through various forms of self-help groups or women-only memberships to facilitate women's economic and social improvement (Lahiri-Dutt and Samanta, 2006). These self-help groups and membership organizations serve as an important ground for women to build their leadership skills (Horowitz 2009). The promotion of women is also evident through their participation in village panchayat raj institutions (Birner 2010), self-help groups for poverty alleviation (Husain, Mukerjee, and Dutta 2014) and in the microfinance sector (Kalpana 2017). However, there is less attention paid by development actors to recognizing the role of women in the market sector. One such important market sector, which has high women participation, is livestock production and especially the dairy industry.

The livestock sector is a key feature of the Indian economy contributing approximately 4.4% of GDP and dairy sector is contributing 65% of its total value (Government of India 2016) and dairy products are important diet components for a substantive vegetarian population (Cunningham 2009). Women play a major role in dairy production, which is considered an integral part of the smallholder farming system. Women in rural areas contribute 75% of the labour in animal husbandry operations such as feeding, cleaning sheds, milking and selling milk (Upadhyay and Desai 2011). Many of these women are in smallholder farm households which are home to 70% of India's cattle (Datta, Shrestha, and Chokkalingam 2015) and are characterized by low livestock productivity.

According to report from USDA 2017, In India, formal market channels such as cooperatives and private companies occupy only 16% of the milk market and most of the milk is marketed through informal channels (36%) such as small-scale vendors. The remaining 48% of milk is consumed within households (USDA 2017). Since milk is highly perishable, the long-term marketing and preservation of high-quality milk requires formal market channels with milk processing facilities. Dairy cooperatives also, link livestock producers to market, which is important for generating income. In addition, these organizations promote investments in innovative technology, which subsequently leads to increased productivity in the sector (Ravichandran et al. 2016; Sauer and Latacz-Lohmann 2015).

The country's National Dairy Development Board (NDDB) which was established in the 1960s has promoted the dairy cooperative movement through the Operation Flood programs which has supported dairy producers to develop a direct link with urban consumers.

However, it is evident that dairy cooperatives and livelihood improvement programs have excluded women and the poor from increasing their income (Candler and Kumar 1998) and also increased women's labour as compared to pre-cooperative settings (Bennett 1991; Quisumbing, Rubin, et al. 2014). A study conducted in Bangladesh found that gender inequalities within households hinder women's control over dairy income in cooperatives (Fischer and Qaim 2012a). At the same time, many governance challenges such as high political interference (Rajendran and Mohanty 2004) and low women participation in the membership and governance structures (Cunningham 2009) of cooperatives also limit benefits for women. However, cooperatives can help women to contest social norms and improve their economic benefits (Agarwal 1997).

To encourage women participation in membership and board structures, under the Operation Flood program, 30% of dairy cooperative at village level were reserved exclusively for women¹. However, due to forced membership women-only dairy cooperatives were less beneficial to women in economic terms than informal milk markets (Dohmwirth and Hanisch 2017).

This qualitative study aimed to evaluate and compare together with 117 women and 87 men the governance challenges experienced by selected women involved in two women only coops, two mixed coops, one private dairy company with no membership, and the informal milk market. It discussed with the respondents the possible alternate options to overcome these challenges. The study particularly focused on gender in order to understand the difference in participation between men and women in the governance system of dairy market channels.

The study finds that inclusion of women in dairy market cooperatives from membership at village level to leadership and managerial roles in management level resulted in good governance and increased income.

¹ <http://nddb.coop/services/cooperative/enhancewomen>

2.3 Conceptual Framework and Literature Review

2.3.1 Cooperatives and governance challenges

There are many studies that assess the performance of dairy cooperatives in the developed world and their production function (Porter and Scully 1987), economic efficiency (Boyle 2004), technical efficiency (Doucouliagos and Hone 2000), internationalization and financial performance (Ebneith and Theuvsen 2005), leverage ratio, and asset turnover (Chen, Babb, and Schrader 1985; Schrader et al. 1985). But cooperatives in developing countries face other issues such as lack of good governance which in turn affect their performance and increase inequality among members (Pritchard 2013; Trewin 2004). The following concepts of good governance were included in this study to measure the performance of different market channels on dairy income. Good governance follow the principle of inclusion of the poorest and vulnerable community in making decisions (World Bank; FAO; IFAD 2009).

Democracy: It is defined as control of organization by its members. Democratization gives rural women and the rural poor a chance to voice their opinions on issues that affect them (Birner 2010). The principle of democracy is the core element of the business cooperatives (Österberg, Hakelius, and Nilsson 2009) and it facilitates good governance. However, there are problems of member democracy in heterogeneous and big cooperatives (Fulton and Giannakas 2001). Representative democracy is followed in cooperatives where members and elected directors participate in governance (Bijman et al. 2013; Chaddad and Iliopoulos 2013). However, when the cooperatives are becoming bigger, the communicative distance between the members and director becomes wider. In order to decrease this distance, cooperatives introduce intermediary representative functions such as councils or committee members meetings at village level (Hakelius and Hansson 2016). The increased distance between directors and members leads to governance problems related to decision-making and follow up where directors are unable to fulfil the need of members and members are unable to monitor the performance of directors which results in decreased loyalty between members and their elected representatives (Richards, Klein, and Walburger 1998).

Inclusiveness: This is defined as the quality of including all sections of the society in the organization. Poor governance in developing countries has refocused the attention towards inclusive growth and strong institutions to improve farm income and reduce poverty (Bernard and Spielman 2009; Singh 2015). In developing countries, access to cooperative membership have positive impact in the farm income (Verhofstadt and Maertens 2015). The concept of

inclusiveness in cooperative organizations can be measured by various indicators (Bernard and Spielman 2009) such as whether all producers can become members, if there are restrictions for membership, whether the membership includes poor, and all classes and ethnicities etc. When the cooperatives are exclusive, inequalities in rural communities increase as has been found in Rwanda (Ansoms 2009; Pritchard 2013). Inclusiveness does not end with membership but also extends to whether benefits are accessed by all members irrespective of their economic status, political capital or caste. Inclusiveness can also be reflected in decision-making in terms of whether decisions are participatory and if they involve diverse members. Mostly, the decision-making in developing-country agriculture market cooperatives are dominated by men even though most of the agriculture activities are done by women (Woldu, Tadesse, and Waller 2013).

Transparency and accountability: In leadership roles of cooperatives, accountability is defined as the acknowledgement and assumption of responsibility for actions, products, decisions and policies (Williams 2006). Transparency and accountability of information facilitate good governance in collective-based economic organizations such as cooperatives (Kosack and Fung 2014). Accountable leadership at village and management level and persistent efforts to ensure the transparency and fairness improve the governance of cooperatives (Mccay et al. 2013).

Standards of management and services: Good governance in the cooperatives depend on performance of the leadership and management team. Cost of managerial opportunism is nil when the leaders are efficient and not opportunistic, and low cost to medium if the directors are effective with clearly defined performance measures (Chaddad and Iliopoulos 2013). Most of the dairy market cooperatives in India follow the traditional cooperative model where board of directors and members committees perform all decision-making duties (Chaddad and Iliopoulos 2013). Governance can be improved if the leadership team has the ability to monitor the performance of management team. The cooperatives have two objectives such as increasing performance for organization and facilitate members to achieve their goal (Soboh et al. 2009). Organizational performance can be achieved through increasing market share, and using advanced processing and technologies which raised the price paid to farmers. Members believe that cooperative management performance is reflected in the economic benefit they receive (Fulton and Giannakas 2001).

2.4 Research Design and Data Collection

In this study, a qualitative case study approach (Yin 2003) was used, which aimed to contribute to a better understanding of five dairy market channels such as mixed member dairy cooperatives, women only dairy cooperatives, producer company, private dairy company and informal dairy market in their implementation process and governance challenges in the village and management levels. Based of the above conceptual framework, elements of good governance and their indicators of measurement were compiled and were used as guide for ethnographic interview and focus group discussion (Table 2-1) to collect in-depth information on the experience of NN women involved in these market channels.

The attributes towards extend of democracy are measured in this study based on the perception of members’ knowledge of how the committee members in village and board of directors in management level are elected, which classes of members are given a chance to raise their voice or speak out on issue, the bargaining power of all classes of members, trust between members, the committee and board of director’s rights and responsibilities.

Inclusiveness is measured based on caste and class in membership, participation in meetings and training, access to benefits, inputs and services.

The study measured the transparency and accountability of dairy market channels through indicators such as whether members know how the milk price is determined, how much bonus they were eligible, whether all procedures of elections are known to members and how people’s compliance are recorded and addressed.

To measure the standards of management, few indicators were included in this study such as staff capacity, how business is expanded with diversity of products, the relationship between members and management, and collaboration efforts with other dairy development actors.

Table 2-1 Indicators to measure governance challenges of dairy market channel

Governance challenges	Means of measurement
Democracy	Election of chairperson, secretary and committee members at village level and board of directors and chairman at management level, voice of members in meetings and decision-making, bargaining power of members, members ‘trust of elected persons in the village and management level, ownership of organizations, representing collective action

Inclusiveness	Whether all economic classes, gender and ethnicity are included for membership, participation in training and meetings, access to benefits, inputs, services and information
Transparency and accountability	Knowledge by producers of information such as how milk price is fixed, bonus calculation, distribution of benefits, inputs and services, election procedures, maintenance of records for meetings and compliance addressal.
Standards of management and services	Education and skills of staff in village and management levels, diversity of products, operational expansion, support for members in inputs and services, networking and collaboration of management

Source: Author

Two main methods of data collection were used for this study, a participatory mapping method called ‘Net-Map’(Schiffer and Hauck 2010) and semi-structured interviews with producers and other stakeholders through ethnographic stays in the villages. Net-maps help to understand the functioning of market channels and their influence on dairy income. Furthermore, they also highlight the relevant governance challenges. Ethnographic semi-structured interview helped to explore the opinion and reflection of members on governance challenges on various indicators mentioned in the above framework.

2.4.1 Net-maps

Two types of Net-Maps were used in this study. To capture the information on the process and implementation of dairy market channels, the “Process Net-Map” tool was used. This is a participatory mapping tool, which allows researcher to identify (1) the steps involved in implementation of dairy market channels, (2) the actors who are formally or informally involved in implementation, and (3) the possible entry points for governance challenges such as elite capture and corruption. To know the influence of the dairy market channels and other dairy development actors on livelihoods, the ‘Influence Net-Map’² tool was used to map all the dairy development actors who support dairy farmers’ livelihoods and their level of influence on dairy income.

In the process Net-Map, two steps were followed (Schiffer and Hauck 2010). In the first step, the researcher probed the respondents to outline the implementation process of the dairy market channel from milk producers to consumers. The name of actors was written on piece of paper and placed on a large sheet of paper. The sex difference of service providers and producers, who receive the benefit or service, was noted down. The implementation processes

² <https://netmap.files.wordpress.com/2008/06/net-map-manual-long1.pdf>

were drawn as arrows between the actors. In the second step, the respondents were asked to categorize the possible problems in the implementation process. Since these are sensitive issues, the researcher informed that the goal was not to pinpoint the issue in the study location, but rather to identify issues related to implementation mechanisms.

On the Influence Net-Map, two steps were followed. In the first step, the respondents were asked to map all the actors who support their livelihood for dairy development and their possible linkages were marked using arrows. Respondents were then asked to rate the influence of different actors on the outcome of dairy income and livelihood improvement (Schiffer and Hauck 2010). The rating was done on a scale from 0 to 6, with 0 indicating 'no influence' and 6 'highly influenced'. The rating was visualized using checker and chess pieces. The checker pieces were used to build the 'tower' which indicates the influence level of dairy development actors on the income of dairy farmers. While performing this exercise, the respondents were also asked to identify why different actors had the influence level and what was ascribed to them. This information was used to describe the attributes of the market institution and related actors and their quality of service and influence.

2.4.2 Ethnographic stay for data collection

Ethnography is the scientific approach to discover and investigate the social and cultural practices in the community, institutions and other social settings (Atkinson and Hammersley 1998; Schensul, Schensul, and LeCompte 1999). Here, we used institutional ethnography (D E Smith 2005) to understand the women and men standpoint in the dairy market channels and to develop a deep understanding on problems or constraints associated with the institutional process in their day-to-day life and how these are embedded in the social relations. Ethnographers discover what people do before assigning meaning to their behaviour and beliefs. This helps to generate the theory based on local contexts. The initial idea or concept, otherwise called formative theory developed in the Process Net-Map, were further investigated through the semi-structured interview while staying in the villages.

The researcher stayed in three villages in Telangana and three villages in Bihar to represent three dairy market channels. The researcher stayed two weeks in each village until sufficient information or knowledge was collected. Semi-structured interviews with open-ended questions were used to collect data around the facts and information related to governance challenges. The participants were also observed for their activities and gender roles around dairy enterprise.

2.4.3 Sampling strategy

The field research was conducted in Bihar and Telangana states of India; both have a varying degree of dairy market channels. One district was selected in each state to include diversity of dairy market channels. To ensure the secrecy of the respondents, the district names are not mentioned. The study included different membership dairy market channels which includes women only membership, mixed membership and no membership. This study assessed three dairy market channels in Telangana: 1) Telangana Dairy Cooperative Women (T-Co-op Women) in which membership is limited to women: 2) Telangana Dairy Cooperative Mixed Cooperative Mixed (T-Co-op Mixed) in which membership is mixed and: 3) Telangana Private Dairy Company (T-Private) which has no formal membership. In Bihar, three market channels were included which are: 1) Bihar Dairy Cooperative Mixed (B-Co-op Mixed) in which membership is mixed, 2) Bihar Dairy Cooperative woman (B-Co-op Women) in which membership is limited to women and Informal Milk Market (B-Informal) with no membership.

The selection of villages was made based on the dominance of the dairy market channel, which was confirmed by dairy institutions staff based on their milk collection records. In each selected village, all producers sell their milk to only one dairy market channel and only villages with one dominant market channel were selected. Six villages were selected in Telangana and Bihar for the Net-Map exercise to represent the mentioned three market channels with two replications for each dairy market channel. The group composition for a focus group discussion for the Net-Map exercise included minimum of four women and four men. After the Net-Map exercise, three villages were selected in each state for ethnographic stay to represent each dairy market channel, details of sampling are explained in Table 2-2.

Criteria for selection of households for ethnographic interviews were based on size of land (small, medium and large), size of livestock herds, quantity of milk sale, caste, and duration of membership or milk sale. Special cases were included like widows, women who can talk fearlessly, women who benefitted and women who have not benefitted from market participation, etc. Initially, 10% of households were selected based on the above criteria to get variation in data and sampling was stopped later when no new information was received. A total of 62 women and 61 men in Telangana and 49 women and 26 men in Bihar were interviewed (Table 2-2). The demographic profile of each village is given in Table 2-3. The researcher participated in the events or meetings during the stay to observe the procedures and discussions which helped to explain the beliefs and facts of respondents.

2.4.4 Data entry and analysis

Process Net-Maps were drawn in Microsoft PowerPoint whereas Influence Net-Maps were drawn in the VisuaLizer 2.2, qualitative data analysis software (Medical Decisions Logic, Inc.) for visual presentation. Ethnographic interviews, minutes of meetings and observations entered into Excel sheet and Word file were grouped and transferred to ATLAS.ti (Scientific Software Development GmbH). These documents were coded initially with open coding. These open codes were further categorized based on similarities and differences. Important quotations from each household for the above categories were taken down in a Word file and reported in this study. The indicators of governance challenges for each dairy market channel were compiled and presented in a table with scoring methods which is explained in the results section.

Table 2-2 Overview of sampling for net-maps and semi-structured interviews

State	Name of village	Net-maps			Ethnographic stay (semi-structured interviews)			
		No of villages	Men	Women	No of villages	Women	Men	Both
Telangana	Dairy cooperative women village	2	9	10	1	24	24	0
	Private dairy company village	2	15	6	1	18	18	0
	Dairy producer company village	2	12	7	1	20	19	0
Bihar	Bihar dairy cooperative mixed village	2	15	18	1	15	15	3
	Bihar dairy cooperative women village	2	12	10	1	24	6	7
	Informal milk market village	2	12	8	1	10	5	5

Table 2-3 Demographic profile of research villages

Demographic profile	Telangana			Bihar		
	T-Co-op women	T-Co-op Mixed	T-private	B-co-op women	B-co-op mixed	B-informal
Background village and institutional arrangement						
Total households	500	3000	500	700	1000	200
Distance to town	12	5	18	8	10	2
Year of establishment	<15 years	>30 years	<10 years	>30 years	<15 years	<20 years
Milk collection Litres/day	1200	1000	150	1500	2000	300
% HH sell milk	20	18	53	20	35	13
Milk price (fat 6% SNF 8.5%) Apr 16	34	31	34	31	31	40
Membership details						
Membership men %	0	100	100	0	95	5
Membership women %	100	0	0	100	5	95
Forward caste %	40	70	10	30	20	20
Backward caste %	20	20	55	50	50	80
Scheduled caste/scheduled tribes %	40	10	35	20	30	0
Dairy animal population						
Total cows	400	220	10	500	1000	50
Crossbred cows	100	150	2	250	300	15
Total buffaloes	500	180	300	200	300	150
Average herd size/household	3.3	2.5	1.5	1.7	2.3	2
Average milk yield/animal	4.4	3.8	2.8	4.6	2.5	3.1

T-Telangana, B-Bihar, Coop- Cooperative, PC-Producer Company, HH-Household, SNF-Solid Not Fat

2.5 Results

2.5.1 Overview of institutional structures and their implementation mechanisms

This following section describes the governance structures and implementation process for addressing governance challenges in the dairy market channels.

Governance structure

The T–Co-op Women follows a two-tier governance structure which is explained in Figure 2-1. All the members at the village level are women except one male veterinary assistant. Ten to 15 villages are clustered together for easy transport of milk and supply of inputs and services. One inseminator, auditor and supervisor are appointed at cluster level. The second level of the governance structure is located at head office or chilling plant which is headed by a managing director (MD) and chairman. From each cluster, one member is represented in the board of directors and they elect their chairman. The finance, quality control and marketing teams work under the managing director (Figure 2-1) and they are well-qualified for their responsibilities. Most of the employees in dairy cooperative are women except the MD, marketing team, and inseminator, which is marked in Figure 2-1 with gender signs.

The T–Co-op Mixed has a two-tier governing structure similar to T–Co-op Women. This cooperative was operated by government for 30 years and recently converted to a producer company where government don't have any role. As the operational area is bigger than that of T–Co-op Women, they have chilling plants in the Mandal³, which are run by a team of staff who process the milk and send it to the district level. The inseminator, auditor, and supervisor placed at the Mandal level support and supervise the process. The MD is a retired animal husbandry professional while the chairperson is a politically influential person who leads the head office at district level. The board of directors (BOD) from the cluster level are politically influential people. Most of the employees and members are men as shown in Figure 2-2.

As indicated in Figure 2-3, T–Private has a two-tier governance structure, one at village level with the agent/secretary, and the second at head office level, which is headed an MD (Figure 2-3). Any issues within the village are handled by the agent with no interference from the management. There is no membership followed in this dairy company so that any producer can sell milk. Most of the producers were men as was the secretary.

³ Mandal is referred as Tehsil which is a small administrative unit like sub-district

As shown in Figure 4, the two Bihar dairy cooperatives (B–Co-op Mixed and B–Co-op Women) have three-tier governance systems (Figure 2-4). The first tier is at the village level with members, secretary and a chairperson. The cluster level is formed with 10-15 villages which share one bulk milk cooler. A milk union is formed by 2-6 districts and a head office is located in one of the districts. An MD leads the head office and is assisted by technical and financial managers. All these milk unions are federated at the state level with the overall head office located in Patna. The federation office is headed by an MD, chairperson and general manager (GM), who are all higher cadre officials of government from organizations such as the Indian Administrative Services (IAS), and is indicated in Figure 2-4. The BOD at union level is made up of representatives of members and the BOD at the federation level is made up of high cadre officials from different departments such as cooperative societies, banks, state finance, NDDDB, and representatives from district unions.

The informal market channel in Bihar operates with a simple system of buyer and producer either via direct relationship or through traders. They have a long-term relationship and the price is decided by the seller but is collectively set by all the women based on the market price set by the cooperatives.

2.5.2 Type of governance challenges in the implementation process

This section describes the implementation process of selected dairy market channels and identifies the potential points of governance challenges which is indicated by dotted circles in Figures 2-1 to 2-4. In T–Co-op Women, a cluster-based approach is followed. The milk is collected from producers by the secretary and transported to a chilling station where it is also tested for its quality and packed for marketing (Figure 2-1). The milk is sold in two to four districts through shops and dealers under a specific brand name. The payment to dairy producers is made through the secretary every 15 days. The inputs and services are distributed to the dairy producers through the technical officers. In this process map, a few farmers from the lower caste reported that fodder seeds were given to elite farmers who have more land resources.

The T–Co-op Mixed operational area is more than 100 sq. km, the milk collection and flow are indicated by arrows 1 to 7 in Figure 2-2. Milk processing is done in two stages, one at Mandal level and the other at district level. The payment system involves depositing of money in the bank account at the Mandal level for all village cooperatives. The secretary has the authority to draw the money upon approval from the chairperson and supervisor and he

distributes the inputs. Members reported that the payments for milk price and the bonus were not transparent. In addition, some producers reported that the benefits or inputs come from the head office to the secretary via the supervisor (indicated by arrow 14) and are diverted to only a few farmers who are rich and politically influential (Figure 2-2). Monitoring is done in a hierarchical way and hence there is no direct support from head office to members at the village level.

Figure 2-3 explains the implementation procedure of the Private Dairy Company in which no membership exists. Here milk is collected by agent and transported to a chilling plant. There is no input support except concentrate feed supply which is sold at a higher price than by other suppliers. The main aspect of T-Private is the credit system for the purchase of dairy animals, the interest rate is higher than in the nationalized banks i.e. 18–20%. There is no monitoring system for the agent; farmers reported lower price for the milk and received no benefits. The target farmers are found to belong to low caste communities who are in need of finance for purchase of animals. Here, the producers do not speak up to raise any issues and there is no proper recording system in place.

In the case of Bihar dairy cooperatives (B-Co-op Mixed and B-Co-op Women), the difference from other channels is that here milk is sold in the district as well as state levels (Figure 2-4). The state fixes the price of milk rather than the union. Here, the secretary is responsible for payment and distribution of inputs with approval from the chairperson and supervisor. A top-down approach is being followed in monitoring and supervision. Producers reported that there is no transparency in the payments for milk as the milk testing is not done regularly. Corruption, elite capture and bribery have been reported between the secretary, chairperson and supervisor in payment for milk, bonus allocation and input distribution.

In the Bihar informal market channel, the producers sell milk directly to consumers or through traders. They set the price which is 5% less than the market price offered by dairy cooperatives. In 90% of households, milk is delivered to the doorstep by women. These households access veterinary, feed and breeding services from private service providers in nearby towns. The producers associated with informal milk marketing in Bihar did not report any governance issues and the producers reported that the payment for milk is timely and that they also receive monetary advances in times of emergency. Details and insights of the governance challenges at the village level are discussed in section 3.4 under ethnographic evidences.

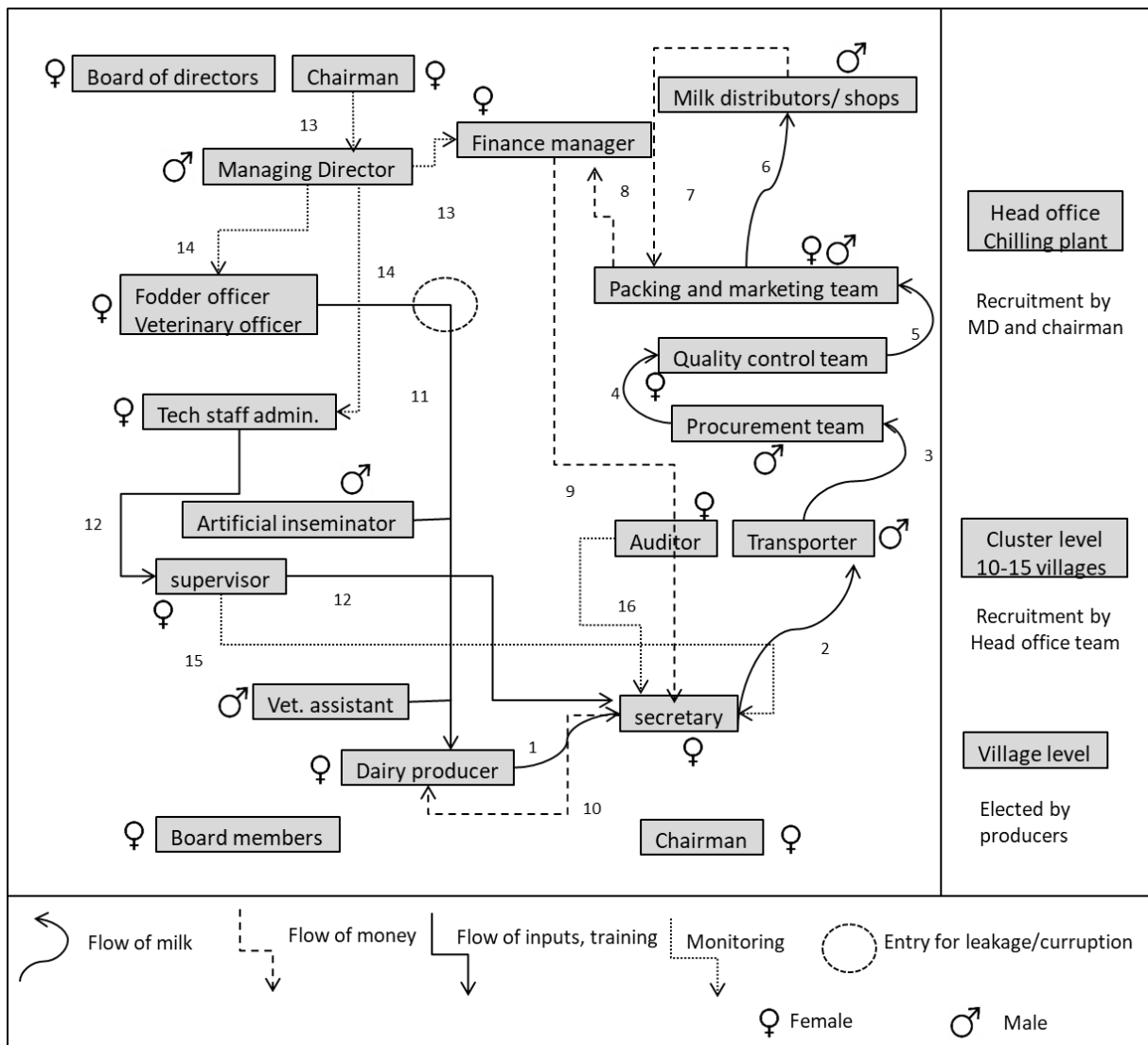
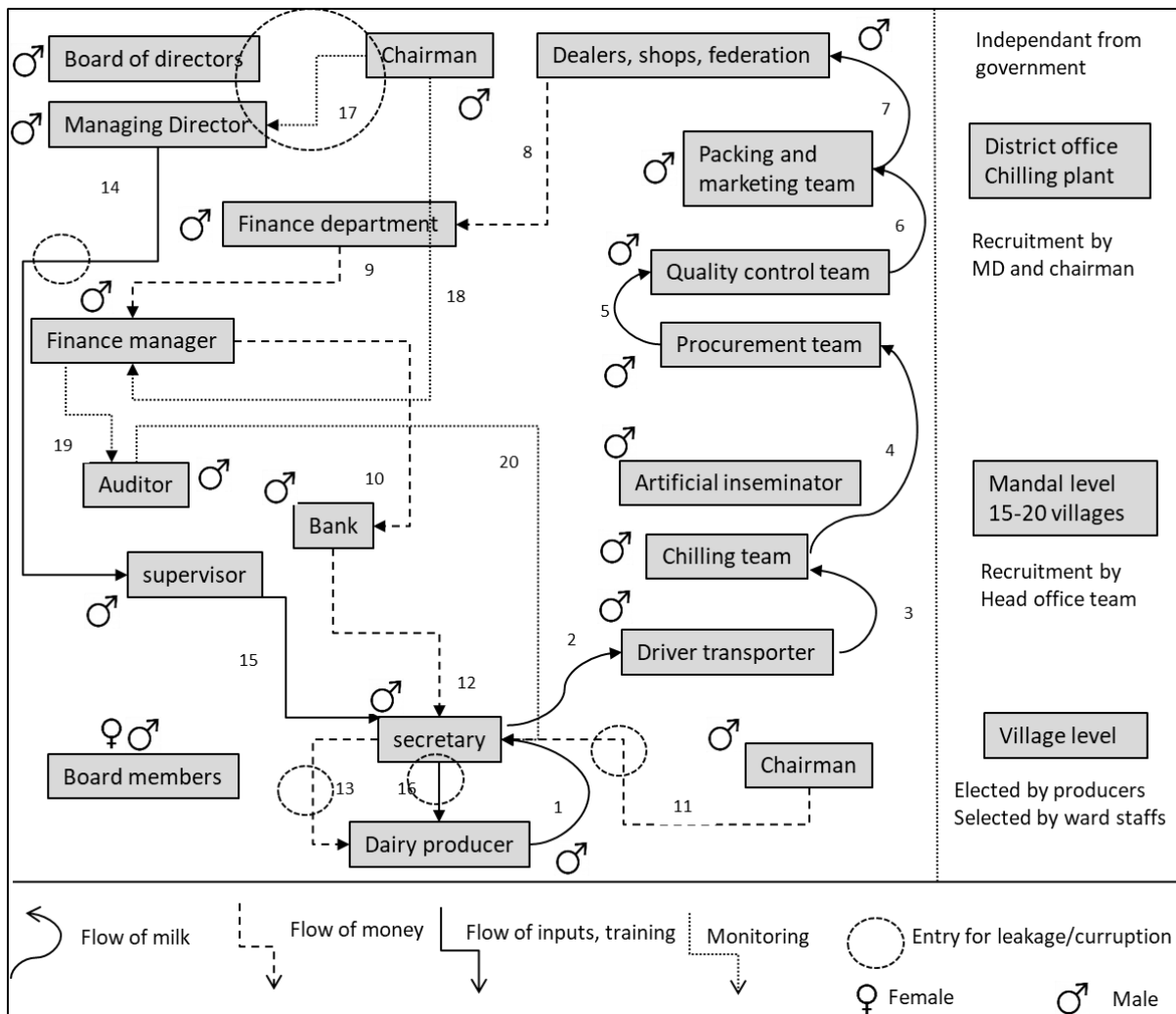
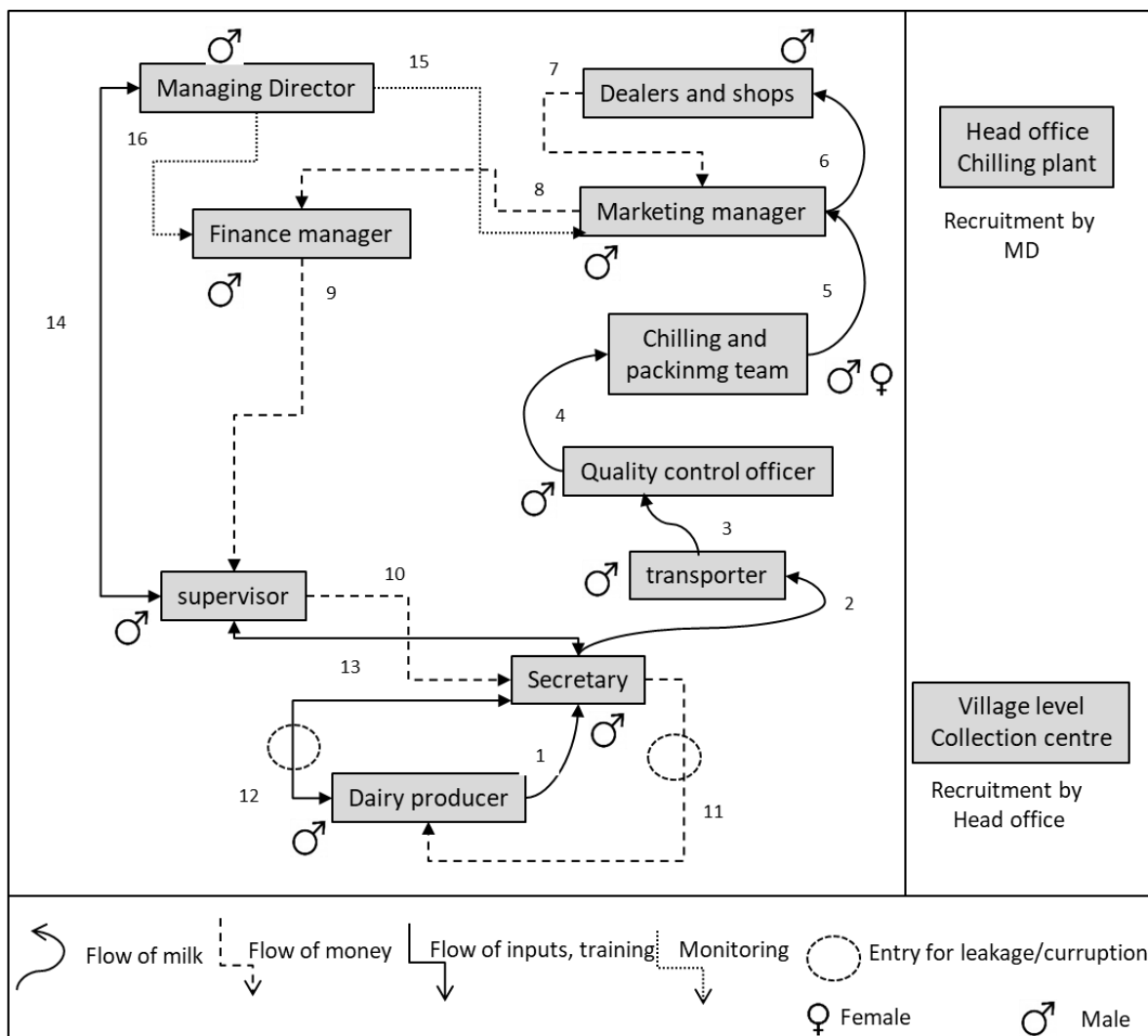


Figure 2-1 Implementation process in the Telangana Woman Dairy Cooperative



- | | |
|---|--|
| 1. Collection of milk | 11. Chairman signs the check for withdrawal |
| 2. Record and send milk to transport | 12. withdraw money from bank |
| 3. Transport of milk for chilling | 13. payment of milk money, bonus to dairy producers |
| 4. Deliver chilled milk to head office | 14. Planning and distribution of inputs and subsidy |
| 5. Quantity checking and sampling | 15. Discussion with secretary for selection of producers for inputs/subs |
| 6. Quality checking | 16. Distribution of benefits/inputs to producers |
| 7. Sell milk and milk products | 17. Approval of plan and monitoring for inputs and benefits |
| 8. Deposit money for sold milk and products | 18. Approval of payments |
| 9. Sale report to finance manager | 19. Checks the audited reports |
| 10. Send money to cooperative account in bank | 20. Audit the payment to dairy producers |

Figure 2-2 Implementation process in the Telangana Mixed Dairy Cooperative



- | | |
|---------------------------------------|---|
| 1. Collection of milk | 9. Distribution of payment to supervisor |
| 2. Record and send milk to transport | 10. Payment of milk money to secretary |
| 3. Transport of milk | 11. payment milk money to producers |
| 4. Record milk quantity and sampling | 12. Request for credit for animal purchase |
| 5. Quality checking | 13. Supervisor access the repayment capacity |
| 6. Sell milk and milk products | 14. Recommends the management for credit |
| 7. Collection of money by market team | 15. Monitoring for milk sale collection |
| 8. Deposit money to finance manager | 16. Monitoring for payments of bills and vouchers |

Figure 2-3 Implementation process in the Private Dairy Company in Telangana

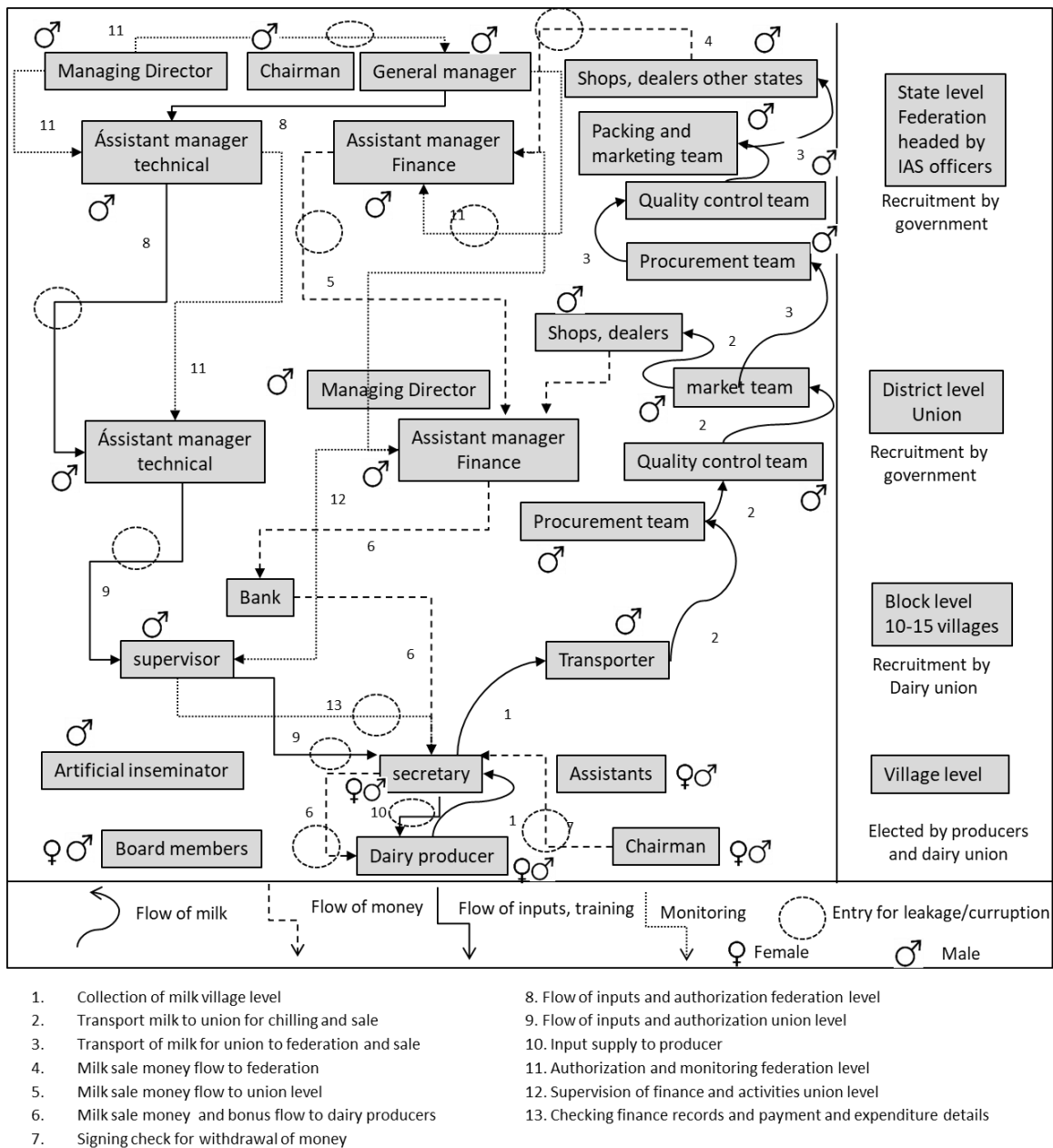


Figure 2-4 Implementation process in the Bihar Woman and Mixed Dairy cooperative

2.5.3 Assessing the influence of dairy development actors on dairy income through a governance lens

The influence Net-Map exercise compared the different market channel organizations with other dairy development actors in terms of their influence level on the dairy income of producers as explained in the section. This influence Net-Map present details of the links between the actors, their support services, ranking of these actors based on dairy income and their influencing governance factors.

Influence Net-Map of dairy development actors in Telangana

Villages under the Telangana Dairy Cooperative Women were ranked first with 6 points⁴ which means highest influence on dairy income, while villages using the T–Co-op Mixed and then the Private Dairy Company scored 4 and 2 points respectively (Figure 2-5). The farmers ranked their influence based on the inputs, service and profit for dairy development (Table 2-4). T-Co-op women and T–Co-op Mixed have provide near similar services because they not only collect milk, but also provide many inputs and services such as breeding, veterinary care support, subsidized feed, etc. to members. A higher score was given to T–Co-op Women (Figure 2-5) due to its good governance through a transparent system in the payment of milk price and biannual incentives as bonuses and more inclusive approach targeting women, the poor and all castes.

Table 2-4 Details of the influence links between the dairy development actors in Telangana

Links from	Links to	Details of services and inputs support	Rank (1-6)	Influencing governance indicators
Telangana dairy cooperative women	Dairy producers	Procure milk, feed and fodder seeds subsidy, animal treatment and vaccination, artificial insemination, animal insurance, member insurance, training and extension, ration balance program	6	Transparency, higher profit, inclusiveness
Private dairy company	Dairy producers	Procure milk, feed supply, credit for animal purchase	4	High interest for credit, no bonus, no breeding service, less benefits
Telangana dairy cooperative mixed	Dairy producers	Procure milk, feed and fodder seeds subsidy, animal treatment and vaccination, artificial insemination, animal insurance, member insurance, women marriage support fund, training and extension	2	Leakage of benefits, elite capture
SRINIDHI program (Dist. Rural Devt. Agency)	Dairy producers	Credit for purchase of animal from their savings through self-help groups and also cumulative interest paid to their savings	4	Easy access to loan, savings of money

⁴ The rank scale is 1-6, 1 is lowest and 6 is highest score of influence

Links from	Links to	Details of services and inputs support	Rank (1-6)	Influencing governance indicators
Agriculture department	Dairy producers	Provide seeds for crops and fodder, subsidy for agriculture inputs	4	Support for fodder seeds, elite capture
	Woman dairy cooperatives			
	Dairy producer Company			
Farmer X village		Provide Napier saplings for fodder cultivation	2	Only fodder saplings
Banks	Dairy producers	Credit for animal purchase, training for dairy management	2	Need collateral for availing credit, complicated procedures, tough to approach for illiterate, poor, landless
	SRINIDHI	Support this programme with cumulative interest for the savings		
	NABARD	Supports through a loan for the eligible dairy producers selected by NABARD		
	Agriculture dept.	Supports the farmers for crop loan through agriculture department		
	Dairy producer company	Supports for selection of fodder crops for their farmers		
NABARD	Dairy producers	Subsidy of interest for credit of animal purchase, link with banks, training and support for fodder production	3	Benefits to elite and influenced people, only few beneficiaries
	Dairy producer company	Supported for the milk processing infrastructure through subsidy		
	Woman dairy cooperative			
	Animal husbandry dept.	Works closely for finance support		
Animal husbandry Department	Dairy producers	Artificial insemination, treatment, vaccination and deworming, subsidy for calf rearing, credit and subsidy for animal purchase	3	Absenteeism, elite capture for benefits, long distance
	Banks	Support as subject matter specialist for dairy related trainings		
	Farmer X village	Helps for procurement of Napier seeds and link to other farmers for sale		
	Dairy producer company	Supply of semen, support for technical knowledge		
	Woman dairy Cooperative	Participate in training programme for capacity building of staffs and farmers		

Links from	Links to	Details of services and inputs support	Rank (1-6)	Influencing governance indicators
Feed company/ feed seller	Dairy producer company Woman dairy cooperative Private dairy company	Supply of concentrate feed	2	High cost, long distance
Balvikas programme	Dairy producers	Water plant for drinking water which helps healthy life	2	Indirect benefit of health

Source: compiled by the authors, based on influence net-maps in Telangana and Bihar (2015 and 2016)

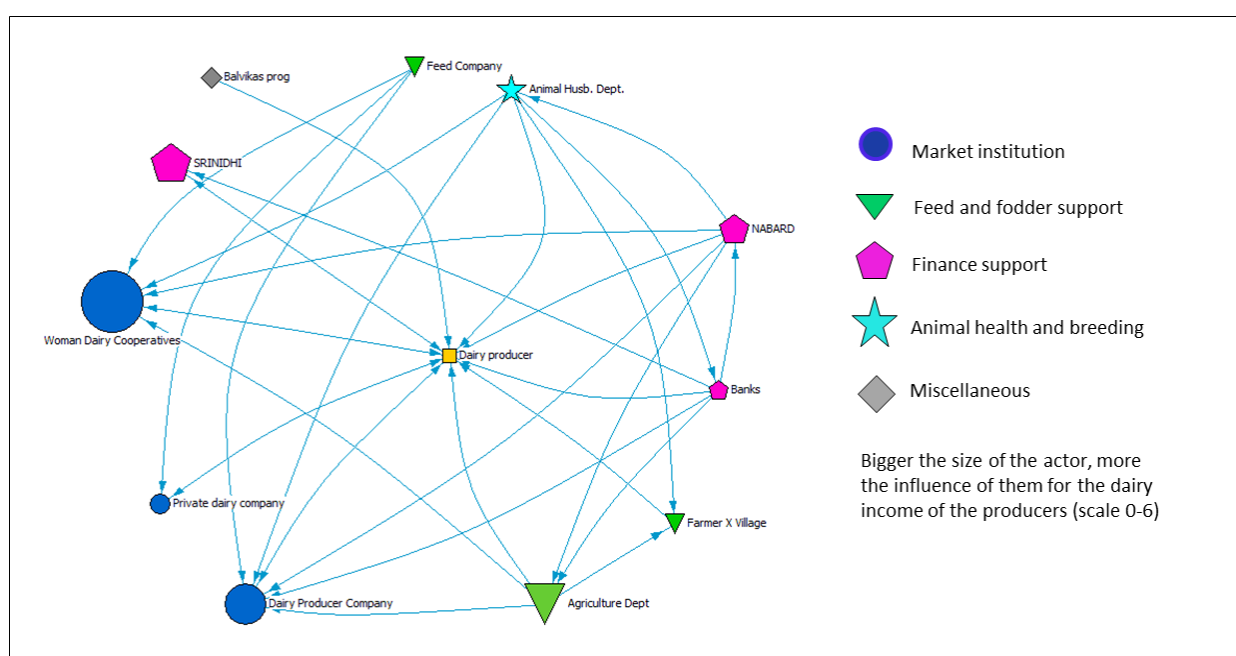


Figure 2-5 Net-Map of dairy farmers in Telangana

The Private Dairy Company scored 2 points, as the producers reported that though it supports credit for purchase of animals, the company's interest rate is higher than that of banks and informal borrowing. In addition, it is evident from the map that T-Co-op Women and T-Co-op Mixed are working closely with other government actors such as the National Bank for Agriculture and Rural Development (NABARD), state animal husbandry and agriculture departments and banks to offer breeding, veterinary care, feed and fodder, and credit services, while the private dairy company is not linked to any of these institutions.

Influence Net-Map of dairy development actors in Bihar

In Bihar, the informal market channel has been ranked high with 6 points along with B–Co-op Mixed (Figure 2-6). Producers from the informal market channel village reported that they get the best price for their milk and payment of money which is received by women. On the other hand, B–Co-op Mixed is considered a great institution for producers in the remote villages because they are able to sell milk and earn income to meet household need and farming-related expenses. The members associated with B–Co-op Women cooperative have given it 4 points (Figure 2-6) and explained that women in the cooperative are merely members and have not actively participated in meetings and decision-making and leadership roles. Lack of transparency in the payment of milk, bonus and input distribution alongside poor governance were the factors reported for the score (Table 2-5). Less collaboration and coordination was observed between the B–Co-op Mixed/women cooperative with other dairy development actors.

Table 2-5 Details of the influence links between the dairy development actors in Bihar

Links from	Links To	Details of services and inputs support	Rank (0-6)	Influence indicators
Bihar dairy cooperative mixed	Dairy producers	Procure milk, feed and fodder seeds subsidy, animal treatment and vaccination, artificial insemination, credit for animal purchase, training and exposure visits	6	Able to sell milk, monopoly, less price for milk, lack of transparency in bonus, benefits, leakage and corruption
Bihar dairy cooperative women			4	
Informal milk market	Dairy producers	Milk procured for home consumption and small shops, provision credit for emergency expenses as advance money	6	Good milk price, easy process, guaranteed return, woman friendly
Banks	Dairy producers	Credit for animal purchase, training for dairy management	2	Poor and landless excluded, difficult to approach, elite capture, corruption and bribery
	NABARD	Supports through loan for the eligible dairy producers selected by NABARD		
	Dist. Rural Devt. Agency (DRDA)	Supports for loan to the Self-help groups created by DRDA		

Links from	Links To	Details of services and inputs support	Rank (0-6)	Influence indicators
JEEVIKA (Bihar Rural Livelihoods Program)	Dairy producers	World Bank funded project under rural development, SHGs for woman, credit and subsidy for dairy animal purchase, training and exposures, crop loan and training	4	Woman friendly, good savings, easy access to credit, share of information and knowledge
	Dairy cooperative mixed	Supports for starting the dairy milk collection in any new village after SHG formation		
	Dairy cooperative woman			
NABARD	Dairy producers	Subsidy of interest for credit of animal purchase, link with banks, training and support for fodder production	2	Benefits to elite and influenced people, corruption and bribery
	Dist. Rural Devt. Agency (DRDA)	Finance support for the SHG groups		
	Animal husbandry dept.	Works closely for finance support		
Animal husbandry department	Dairy producers	Artificial insemination, treatment, vaccination and deworming, subsidy for calf rearing, credit and subsidy for animal purchase	1	Absenteeism, lack of quality service, long distance
	JEEVIKA	Technical support as subject matter specialist for dairy related trainings		
	Dairy cooperative mixed	Organize best animal competition and technical support for trainings		
	Dairy cooperative women			
Feed seller	Dairy producers	Supply of concentrate feed	1	High cost
District Rural Development Agency	Dairy producers	SHG formation, credit for dairy animal purchase, subsidy farm inputs	1	Lack of transparency, corruption and bribery
Buffalo breeder	Dairy producers	Who has bull and provide breeding services for buffalo owned farmers	3	Easy access, doorstep service
NGO	Dairy producers	Training for dairy management, treatment and vaccination camps	2	Only training

Links from	Links To	Details of services and inputs support	Rank (0-6)	Influence indicators
Agriculture department	Dairy producers	Provide seeds for crops and fodder, subsidy for agriculture inputs	1	Elite capture, hard to approach
	JEEVIKA	Support trainings towards better farming and management		
	NGO	Support through provision of seeds and subject matter specialist for training		
	Banks	Forward the farmers for availing the crop loan		
Private vet/paravet		Doorstep treatment of animals and artificial insemination	4	Doorstep service, easy access

Source: compiled by the authors, based on influence Net-Maps in Telangana and Bihar (2015 and 2016)

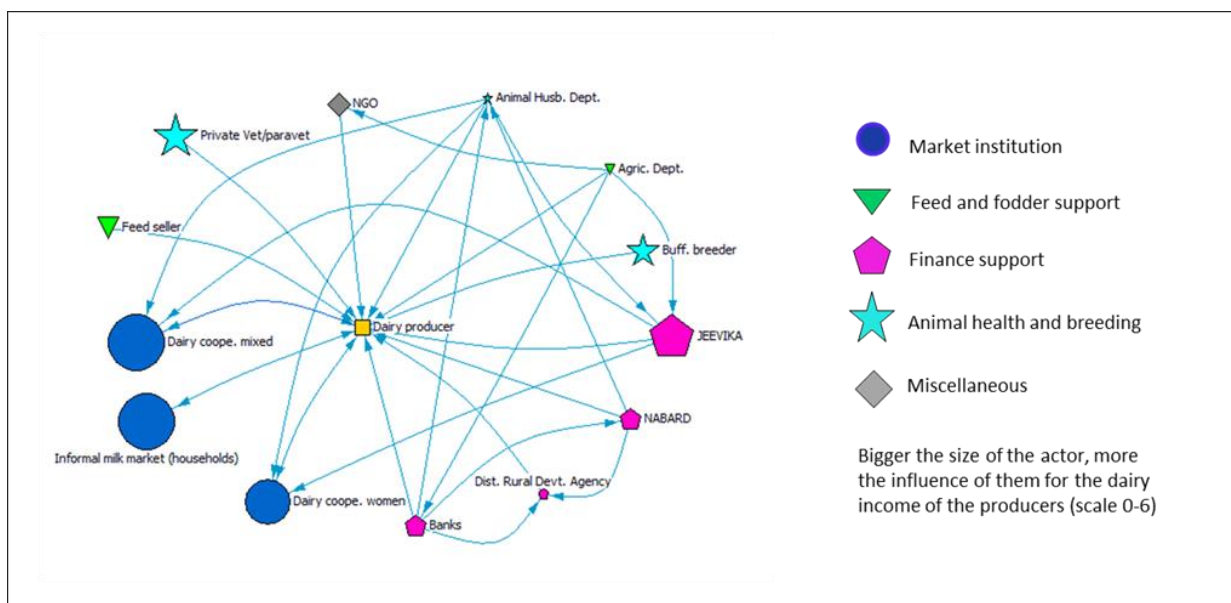


Figure 2-6 Net-Map of dairy farmers in Bihar

2.5.4 Micro-level evidence of governance challenges in membership-based marketing channels (cooperatives)

There were different governance challenges between the membership based cooperative channels. The following section describes the governance challenges faced by dairy producers in dairy cooperatives at the village level. The results of a comparison of the issues is presented in Table 2-6. This has been divided into two aspects: (1) Micro or village-level and (2) management-level in either districts or states. The results were presented according to the main indicators of governance challenges such as democracy, inclusiveness, transparency and standards of management and services. Each indicator has been discussed in detail for each dairy market channel with evidence from household interviews and focus group discussions based on indicators of governance challenges (Table 2-1). The indicators of governance challenges were marked as follows: ‘+++’ indicated excellent governance, ‘++’ good governance, ‘+’ medium governance and ‘-’ poor governance (Table 2-6 and Table 2-7). The results were presented for the village and management levels.

Democracy at the micro level (village)

Bihar Co-op Women

B-Co-op Women village had a low score for democracy at village level due to lack of democracy in the selection of the chairperson, secretary and member committees, right to vote, bargaining power, ownership, collective action and speaking out on issues (Table 2-6). According to the Bihar dairy cooperatives rules, members, the secretary and chairperson should be women in women-only member cooperatives. The chairperson is elected every five years. But, in the studied village, the secretary and chairperson have been in their positions for more than five years. The secretary is a woman for recording purposes, but the actual work is done by her husband, who is a politically influential person belonging to a higher caste. While interacting with the supervisor and secretary’s husband, it was observed that the space for the dairy collection centre was given by secretary’s family and he is also related to the supervisor. The secretary’s husband is the one who handles milk collection, decision-making, price calculation and payments to producers. His wife, who is supposed to be the secretary, merely cleans the dairy containers and prepares food during meetings or training. Similarly, the chairman, a woman who was also selected by the secretary and the supervisor, is a neighbour to the secretary and her husband is also a politically influential person in the village from a higher caste. The chairperson is an illiterate woman and her husband, who is educated, makes

decisions together with the secretary's husband. About 60% of the interviewed respondents reported that the cooperative had not conducted elections for many years. Expressions of a few women from lower caste regarding the right to vote and related issues, which are quoted below, indicate the depth of the issue:

'I don't know that the chairperson is selected based on election, the position is for highly influential, rich and higher caste people' (12, B-Co-op Women village).

'The chairperson's husband and secretary's husband are influential persons in this village, so they make many decisions for dairy cooperative. They asked me to vote once for a chairperson so I did. I can't deny them as I have to sell milk to them' (15, B-Co-op Women village).

The members of the lower caste of B-Co-op women cooperative were also found to be weaker in demanding for any rights or raising any issues. It was observed that women dairy producers from the lower caste community face problems in interacting with the secretary's husband and have also been threatened not to raise any issues against him, lest the milk procurement is stopped. When we asked about the secretary and her husband, the women lowered their voices and spoke softly so that others would not hear which might indicate the oppression they face. The following statements by some of the women indicate the depth of challenges associated with raising their voices:

'We are quiet because if we raise our voices, then we can't sell our milk as we don't have an alternate market channel' (4, B-Co-op Women village).

'We are born in lower caste and are landless and we are depending on their land for our houses, so it is difficult for us to raise issues with them (upper caste), this is the politics of the secretary and village life in Bihar' (30, B-Co-op Women village).

Bihar Co-op mixed

The B-Co-op Mixed arrangement had a medium score for many indicators of democracy at the village level. The main reason for this is that there has been a democratic election of the secretary by dairy members. The secretary is a teacher in a private school in a nearby village who tutors students in this village and he played a key role in starting the dairy cooperative. One woman said,

'We know him very well. He brought dairy cooperative in this village and he has much knowledge; so, we allow him to be the secretary and we agree to his selection of chairperson as they have to work together' (8, B-Co-op Mixed village).

The election of chairperson is not democratic (Table 2-6). Though the secretary was considered to be fair, some political influence cannot be avoided in Bihar: The chairperson, who is an influential woman from an upper caste, has been at the helm for 10 years and her house is located close to the dairy collection centre. The chairperson's family had only one buffalo initially, they have received subsidies and loan for four cross-bred dairy animal purchases in the last 10 years due to political influence. The study found that subcontracts for supplying food during meetings was given to the chairperson due to her influence. Fodder seeds, which came from the dairy head office, have been distributed only to a few households who are upper caste in this village.

Telangana Co-op Women

Democratic processes are adhered to strictly in the system of T-Co-op women village in Telangana which had 'excellent' and 'good' scores for governance for many indicators of democracy. The secretary and chairperson are selected based on voting by the members (Table 2-6). Furthermore, the secretary and chairperson come from a poor background. The chairperson has been changed twice in the last 10 years and was once elected from a lower caste community, which again indicates the democracy at the village level in this cooperative. All the members reported that they participate in voting. One woman said that,

'When there is an election, the dairy staff informs members, a secret ballot system is followed on election day for selection of the chairperson and once we had a chairperson from lower caste too' (9, T-Co-op women village).

When we observed the meeting records of this village, there was evidence of collective decision-making and members could speak out on any issue. Proceedings of one of the meetings attended by researcher were recorded. All the participating members signed the register of the meeting. The meeting register was not evident in any of the other three dairy market channels.

Telangana Co-op Mixed

In T–Co-op Mixed village, the democratic indicators had a medium score, but this score was weaker compared to that of the T-Co-op Women village (Table 2-6). The lack of a voting system and the presence of the same secretary and chairperson for the last 20 years was highlighted. The absence of democracy was also reported in terms of participation in voting, with many dairy producers and other members saying they had not participated in an election at the cooperative. Even though the dairy cooperative has been converted into a producer company model, the members are not aware of this. One man said:

‘The chairperson of Vijaya dairy (previous name when it was a government-based dairy cooperative) is selected by their high officials; we have not participated in any voting process’ (20, T–Co-op Mixed village).

Inclusiveness, transparency and accountability at the micro level

Bihar Co-op Women

In Bihar, B-Co-op women had moderate to poor scoring for inclusiveness and transparency. Even though the membership is reserved to women only, most of the decision-making and financial management is handled by men. For this reason, the respondents gave moderate score to gender inclusiveness (Table 2-6). Both mixed and women cooperatives of Bihar are less inclusive of the poor and all lower caste people. There is evidence from the household interview from the poorest and lower caste community of benefits received and the issues they have raised. However, many producers from the lower caste reported that they have never received any bonus money from the dairy cooperative. As per cooperative principles, a part of the annual profit should be given back to the members as a bonus, however, it is distributed to people in the higher castes with members in the lower castes receiving little. One woman from the scheduled caste said:

‘Our milk cards with price details are not filled for many months, only the quantity of milk is recorded, and I have never received any bonus for many years’ (32, B–Co-op Women village).

Furthermore, many members of the lower caste community expressed that they never attended any meeting or training. However, many dairy producers from upper castes have received bonus regularly though the bonus is not as per the standards.

Decision-making at the village level should be decided through meeting with members. But only a few women from lower castes have attended these meetings. Overall, only 19 out of 37

interviewed women participated in meetings or training sessions within and outside the village, most of them belonging to upper castes except two from a lower caste. Selection of staff in this cooperative is not transparent. The secretary's sister-in-law was trained, 20 years ago, as an inseminator but her husband does the job as she got a job as primary health worker due to political influence of this family. The benefits from the dairy cooperative is captured by the political elites indicated below (Table 2-6). It was observed that higher caste members, the secretary and the chairperson, possess most of the crossbred dairy animals which were received through subsidy and credit from the cooperative, though these benefits are supposed to be limited to the lower caste community who are not aware of any such schemes.

Bihar Co-op Mixed

The B-Co-op mixed cooperative has similar scores to those of B Co-op women except in inclusiveness of women and poor households which was better (Table 2-6). The secretary, a man, has motivated many women to join the dairy cooperative and one woman said, '*we get a high rate for milk in summer due to high fat content in milk*' (5, B-Co-op Mixed village) which indicates awareness of price. Many women and men who live near the dairy centre have received bonuses for the last 10 years. Further, 12 men and 7 women members said that they have participated in meetings and training sessions. Distance also plays a role in the asymmetrical propagation of information and distribution of benefits in this cooperative. Women and men from nearby settlements (0.5–2 km) of B-Co-op Mixed village have not received any bonus payments. One man said,

'We are far from the dairy, so they don't call us and we are not aware when there will be meetings. If invited we would like to go for meeting and training' (22, B-Co-op Mixed village).

However, there is an inclusive staff recruitment and selection at the village level in B-Co-op Mixed. The secretary selected four assistants who are women and poor who carry out milk collection and recording. Every woman in this village calls him 'Guruji' which means 'teacher'. One of the woman dairy staff said:

He has given me a life by giving me this job. When I came to this village after marriage, there was not much respect from my in-laws as I am from a poor background, though I am educated to secondary school level. After getting this job, my in-laws respect me (38, B-Co-op mixed village).

On the other hand, most of the input support from the cooperative is received by the political elites from upper castes because of pressure from the chairperson. One woman said:

‘We never know that any credit or subsidy is given in the dairy for the purchase of dairy animals and most of the benefits are routed to politically strong people in the upper caste’ (23, B-Co-op mixed village).

Telangana Co-op Women

The T-Co-op women cooperative follows the principles of inclusiveness strenuously, at all levels, for gender, status and class which was indicated by excellent scores for most of the indicators (Table 2-6). The dairy staff at the village levels are selected based on discussion with all members. Membership is open to all producers in the village. The secretary, a woman, was appointed by the chairperson and members. She has been working for the last eight years in collecting milk and recording data, she said:

This gives me much confidence and I spend my salary in educating my son. This dairy is helping my livelihood so I follow all the procedures very transparently and there is a strict monitoring of records and payments every 15 days from head office (Secretary, T-Co-op women village).

All the members interviewed out of 40 households reported that they receive bonuses every six months. The members feel proud that milk collection has increased fourfold within a period of 12 years. The cooperative does not give credit for purchase of animals. But, they provide veterinary services and breeding services with a 50% subsidy for all the members equally, without elite capture. A few aspects such as seeds for fodder are given to top elite people who owns maximal land resources. Most of the members, except two, reported that they attended management meetings and training in better feeding practices at the village and the head office.

Telangana Co-op Mixed

The indicators for inclusiveness were scored from good to medium for governance. Though the membership is open to men and women, 15 out of 20 women interviewed in the T-Co-op Mixed village said

‘The dairy cooperative belongs to men; the government allows only men to become members so my husband is a member of the dairy cooperative’.

However, the membership is open to all classes including the poor and lower-caste members. But the latter do not receive benefits equal to those of people in the higher castes, implying prominent elite capture. When there is any subsidy for animal purchase or scholarship for children's education, most of it is captured by the rich and influential households of higher castes. A few producers from lower castes (two out of six) have attended the meeting and training sessions but have not actively participated in any decision-making within or outside the village.

Democracy at macro level management and standards of management

Bihar Co-op Women and Mixed

The main indicators of democracy at management level, such as selection of the chairperson or directors received a poor score because the chairperson is elected by the government, and higher-level officers who are politically influential and associated with the current political party. Many producers and the chairperson of the village cooperatives reported that they are not aware of who the chairperson is at the union level. The position of chairperson and MD at the state level was occupied by the higher cadre of government officials from the Indian Administrative Service (IAS). Political lobbying for these positions is very high because those who fill them are the principal decision-makers and planners. There is no transparent mechanism followed for filling these positions as is noted with minus mark in Table 2-6. The researcher observed a change of chairperson at the state level within one year of data collection in Bihar due to changes in a political party. The service received by producers is substandard, especially in terms of veterinary and feeding support and breeding services. But the diversity of the dairy products produced by the Bihar dairy cooperative is higher with 26 milk products available. Political dominance is very high with a top-down approach. Producers expressed 'dairy Sarkar kha hai', which means 'dairy belongs to the Government'.

Telangana Co-op Women

The indicators of democracy at the management level and governance standards of staff had an 'excellent' or 'good' score. Interviews with the MD and chairperson of T-Co-op women revealed that they have held these positions since the start of the women dairy cooperative. These positions were given by the founder who was working as MD in a rural bank and had much political influence. One interesting finding is that each producer interviewed in T-Co-op women village knew the name of the MD and the chairperson of their dairy cooperative and they said that they were happy with the leadership and the profits the members make. The

process of selecting the chairperson is recorded and for the last three terms she has been selected as the chairperson by their members from the cluster level. The chairperson and BOD are happy with the MD of whom the chairperson said:

'He is highly educated, doing a good job, has expanded our cooperative from 30 villages to 127 villages in a decade and the profit is high in the last few years. We have always contributed for his decision-making towards development of this dairy cooperative'

Standards of management in this cooperative were found to be good (Table 2-6). The staff at the dairy office are well qualified for their positions and are selected based after interviews. Preference for position is given to local staff who understand the situation better. There is a strict system of attendance in meetings with biometric data (signature) recording, and monitoring and evaluation of staff is done regularly. The meetings are conducted every 15 days without fail and reports are maintained properly. Producers reported that the support from management in providing input and services was satisfactory. This cooperative has good collaborations with NDDDB and other organizations, but they act autonomously without any interference from government. Maintaining the compliance record was evident with the T-Co-op women than in any other channel (Table 2-6).

Telangana Co-op Mixed

At the T-Co-op Mixed, the indicators of democracy in management and standards of staff had 'excellent' to 'good' scores (Table 2-6). However, the dairy members do not know the name of their chairperson and many producers were not aware of the change of this cooperative into producer company. The present chairperson, with political influence, has held the position for the last 30 years and was involved in a court process that changed this cooperative from a government-based one to an independent producer company. Its board of directors is made up of individuals from the higher caste in that region. The dairy expanded its operation after it became a producer company its products are sold in other states. The staff at the head office were found to be technically qualified. The MD is a retired animal husbandry official. The technical support for breeding services, veterinary care, feed support and credit services are appreciated by the producers who said the company also gives non-technical support like funding for the education of children, insurance, emergency loans, etc.

Table 2-6 Governance challenges in dairy market channels with membership

Governance challenges	Telangana		Bihar	
	T-Co-op Mixed	T-Co-op women	B-co-op mixed	B-co-op women
<i>Democracy at village level</i>				
Election secretary is democratic	++	+++	+	-
Election chairman is democratic	+	++	-	-
Selection committee members is transparent	+	+++	+	-
Raising voice in meeting	+	++	+	-
Raising voice in decision-making	+	++	+	-
Bargaining power of members is present	++	++	+	+
Ownership is felt by members	+	+++	+	+
Trust between chairman and members is good	+	++	+	-
Collective planning and action is present	+	+++	-	-
<i>Inclusiveness: gender, poor, caste</i>				
Inclusive membership-gender	+	+++	+	++
Inclusive membership- poor and class	++	+++	++	++
Inclusive participation in meeting	+	+++	+	+
Inclusive participation in training	+	+++	+	+
Access to benefits by all	+	++	+	+
Access to resources and inputs by all	+	++	+	+
Access to information by all	++	+++	-	-
Elite capture is absent	-	++	+	-
<i>Transparency and accountability</i>				
Pricing milk is transparent	++	+++	++	++
Bonus distribution is transparent	+	+++	-	-
The election is transparent	-	++	-	-
Well maintenance of records	++	+++	+	+
Compliance addressed	+	++	-	-
<i>Democracy management level</i>				
The election of the chairman is democratic	-	++	-	-
Selection of board of directors	+	++	-	-
Selection of managing director (MD)	+	+	-	-
Raising a voice in decision making is allowed	-	++	-	-
Trust between chairman and MD is good	++	+++	++	++
<i>Standards of management and services</i>				
Staff capacity and skills are standard	++	+++	+	+
Good managerial skills of MD	++	+++	+	+
Diversity of products	+++	++	+++	+++
Expansion of operation	++	++	+++	+++
Support for inputs (feed, AI, veterinary service, credit and extension service)	+++	++	+	+
Good relationship with members	++	+++	+	+
Collaboration with development organization	+	+++	++	++
Government or politician dominance is absent	++	+++	-	-

+++ Strong agreement; ++Moderate agreement; +Less agreement; -No agreement

Source: Compiled by the authors, based on net-maps, ethnographic interviews and observation in Telangana and Bihar (2015 and 2016).

2.5.5 Governance issues in models without membership

While assessing the non-membership channel of Telangana-private and Bihar-informal, emphasis was given to find any governance issues. A few indicators were evident in these two models. The informal market channel in Bihar was found to involve especially women who can sell milk at doorsteps. The price for sale of milk was high and women were found to have high bargaining power. Whereas the private dairy company in Telangana was found to have a good price for milk, men dominated the list of beneficiaries. In both channels, there was no support for productivity enhancement through feed, breed improvement and veterinary services (Table 2-7).

Table 2-7 Governance challenges in dairy market channels without membership

Governance challenges	T-private	B-informal
Bargaining power of members is present	-	++
Ownership is felt by members	-	+++
Collective planning and action is present	-	++
Inclusive sale of milk-gender	-	+++
Inclusive sale of milk: poor and class	+	+
Pricing milk is transparent	++	+++
Well maintenance of records	+	+
Compliance addressed	-	++
Diversity of products	++	-
Expansion of operation	++	+
Support for inputs (feed, credit and extension service)	+	-
Good relationship dairy producers and client	+	++
Collaboration with development organization is present	-	+

+++ Strong agreement; ++Moderate agreement; +Less agreement; -No agreement

Source: Compiled by the authors, based on Process Net-Maps, Influence Net-Maps, ethnographic interviews and observation in Telangana and Bihar (2015 and 2016).

2.6 Discussion

2.6.1 Comparison of dairy cooperative's governance between Telangana and Bihar

Overall, the findings indicate that the dairy market channels especially dairy cooperatives of Telangana have better governance performance than the ones of Bihar state. The women-only dairy cooperative in Telangana was found to have the best governance compared to other market channels studied, but the same model in Bihar was found to have poor performance.

Few core factors are responsible for the differences in governance performance between the cooperatives in the two states. One factor that contributes to the performance differences is the size of a cooperative. This study indicates that women only and mixed dairy cooperative in Telangana are operating in a defined small operational area of about 30 to 100 sq. km. Whereas the cooperatives in Bihar are federated at state level and their operational areas spread to around 500 sq. km across states with single policy even though they cover varying geographical areas. Our finding support the previous literature, as the number of members increases and activities grow in a cooperative, the democratic cost of collective decision-making becomes high (Pozzobon and Zylbersztajn 2013). The communication and relationship within members and management which are critical for the efficiency of cooperatives (Bhuyan 2007) suffer as a result wider operations.

Another important reason for the difference in governance between states is the political environment in which the cooperatives operate. Even though Telangana was separated from Andhra Pradesh (AP) in 2006, they follow the same dairy policy as AP which is now being reviewed. This government of AP was the first to support independent dairy cooperatives without government interferences through implementation of the Mutually Aided Cooperative Society and Producer Company Act which encouraged women to participate in dairy cooperatives. In the case of Bihar, the dairy cooperative policies were developed at state level, but implementation at the village level is meagre. Well-intended and thought out policies may not have an impact if they are not implemented properly at regional or village levels (Banerjee and Duflo 2011). Low-level democracy is perpetuated from the state level to local governance level through bad political institutions (Acemoglu and Robinson 2012) which is evident in Bihar. A cooperative will fail if its concentration is not towards business but rather in serving political interests, such as lobbying (Goddard, Boxall, and Lerohl 2002).

Another indirect factor which is responsible for this difference in governance and performance is the level of education of key members in cooperatives. Education of the leadership role members was a key determinant for good governance. Low literacy levels are a barrier in decision-making and ensuring transparent governance which is evident in Bihar especially in women cooperative where chairman and secretary were illiterate. According to a United Nations International Children's Education Fund (UNICEF) census in 2011, the literacy rate is higher in Telangana (66%) than Bihar (54%) and the gender gap is lower in Telangana (17%) than in Bihar (27%). These factors indirectly affect the performance of cooperatives in the two states. Educated members and leaders can facilitate and maintain fairness and transparency through record keeping. A previous study on the village panchayat system in Bihar showed that selection of beneficiaries was biased due to the illiteracy of the Panchayat president, who was a woman (Birner 2010). A study on rural panchayats in Maharashtra also found that members with low literacy levels found it difficult to participate in decision-making processes which demanded written work and legal knowledge of agendas, minutes and schedules (Datta 1998).

2.6.2 Are gender-based membership arrangements the key to good governance?

In Telangana, women-only membership cooperatives performed better in good governance in terms of democracy, transparency, inclusiveness and standards of management compared to the mixed dairy cooperative. There is an argument in the literature that there is a need to include women as key stakeholders in decision making rather than see them as doing subordinate dairy activities (George 1991). In a similar fashion, the women-only membership cooperative in Telangana was established based on a bottom-up approach with the aim of empowering women by promoting them at all levels, starting from village-level membership, and leadership to higher level management (Figure 2-1). This approach paves the way for women's decision-making and they do not hesitate to interact with members at all levels. This approach has enabled the cooperative's management to interact easily with members. This is complemented by straight-forward communication mechanisms between the women staff in management to village members. This structure facilitates better planning and monitoring and has reduced governance challenges. This finding supports the previous argument of including women just as members in cooperative does not help for their development, women should be included in higher level such as planning and implementation of cooperative governance (Cunningham 2009; Rajendran and Mohanty 2004).

However, the results from Bihar showed that mixed-membership cooperatives had better governance compared to women-only membership cooperatives in terms of women's participation, democracy and transparency. One important consideration is that the Bihar dairy cooperatives follow a top-down approach. The management at the state level decided that some cooperatives (30%) would have women-only membership. The bargaining power of women increases when they are involved voluntarily. Similar results were found in Karnataka dairy cooperatives where less empowerment of women has been observed within women-only cooperatives compared to mixed-membership cooperatives due to voluntary selection (Dohmworth and Hanisch 2017). Another argument is that women only membership cooperatives in Bihar follow the shadow women managers (Birner 2010) where their role is insignificant and their husbands are the main decision-makers which hinders other women from interacting or expressing their views. Yet another factor for the good performance of mixed membership cooperatives in Bihar is that an enabling environment for the participation of women, was achieved by the good leadership of the male secretary who encouraged women's participation. This suggests that there is a need for good leadership structures that promote shared governance (Gardiner 2006) and that support democratic and transparent functioning of the cooperatives.

Secondary data indicates that the performance of women-only membership dairy cooperatives in Telangana has grown fivefold in the last 10 years in quantity of milk sold while women-only dairy cooperatives in Bihar have grown 1.5 times in last 10 years.

2.6.3 Performance of the informal milk market and private dairy

In the non-membership dairy market channels, it is worth noting that the informal milk market was found to be more women-inclusive, transparent, and to offer a better price and greater bargaining power for producers than private dairy company. Moreover, the income from the informal milk market is controlled by women, whereas the private dairy company in Telangana was found to lack inclusiveness and transparency where participation and dairy income is controlled by men. In India 36% of milk is sold through informal market channels (Landes et al. 2017), the share will continue as consumers prefer fresh raw milk and this gives better price for producers (Thorpe et al. 2000). In the past, many criticisms of the informal milk market sector were not based on empirical evidence and organized milk market channels were prioritized in budget allocation and policy support. According to a recent study by the International Livestock Research Institute (ILRI), the standards in the informal milk market

channels can be improved if the informal value chain actors such as milk traders are trained and certified to maintain the quality of milk (Johnson et al. 2015; Kumar 2010).

Liberalized policies have encouraged the entry of private dairy firms in the India with the assumption that private players will be more cost-effective than cooperatives which will lead to more investment in technological improvements which will contribute to reducing the market price of milk (Singh et al. 2001). This study showed that the private dairy companies have not invested in technological improvements but rather are using the platform of milk marketing to promote credit businesses which exploit the poor. Public-private partnerships can help to avoid this exploitation.

2.6.4 Reflection on the methodology

The strength of this study lies in the ethnographic stay in villages which enabled participatory interaction with producers and other stakeholders. This interaction provided detailed insights of governance challenges faced by producers which were validated by the findings of focus group discussion using Net-Maps. Most of the indicators for governance challenges emerged from the ethnographic interview with the producers and net-mapping. The study, however, could not include the informal model in Telangana and the private model in Bihar, which would have given a better comparison of market channels within the two states. The researcher stayed only two weeks in the village for collection of data due to time limit and availability of resources which may not be deeper exploration of ethnographic survey however the researcher tried to collect diversified opinions. Future studies can be aimed for longer ethnographic stay to cover variations of households to see efficiency of market institutional arrangements for household income and welfare.

2.7 Conclusion

Based on this study, it can be concluded that more transparency can be achieved in the services and inputs at the bottom of the pyramid in the cooperatives when poorest and women are given priority. In the wider development context, it is important to increase women's participation at all levels of cooperatives from membership to leadership and management levels to overcome the governance challenges in dairy cooperatives.

Good leadership at village level without political interference is key for improving governance structure for collective action in cooperatives. The informal dairy marketing sector is helping women and poorest, but is lacking technical, service and management support. The future expansion of the sector will require the relevant policy support.

Women-only membership arrangements alone do not necessarily lead to increased dairy income for women members. Future interventions should focus on moving from one-size-fits-all to good-fit dairy institutional arrangements in which consideration is given to the local, social and political environment.

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3 Determinants of women's participation and control over dairy income from dairy cooperatives: Evidence from Bihar and Telangana villages, India

3.1 Abstract

Under-representation of women in producer organizations are very evident in developing countries. Women face more barriers to participate in market for sale of products and access to input and services. This study aimed to explore the factors which determine and influence women's participation in dairy cooperative and evaluate the positive and negative outcome of participation. The data were collected from women only membership dairy cooperative and mixed membership dairy cooperative from Bihar and Telangana. The data were collected from 61 men, 81 women and 11 men and women together using semi-structured interviews while staying 2 weeks in each representative village. A descriptive analysis was carried out to calculate percentages and means for determinants of participation of women in dairy cooperatives. High level of participation of women in membership, training, decision making meeting and leadership level and control over dairy income were observed when the cooperatives are reserved for women only set-up from village level to union or federation level. Education and knowledge through training and capacity building plays an important role for women within household which supports for bargaining power and decision making which influence participation of women in dairy cooperatives and control over dairy income. Social capital through participation in self-help groups supports women to contest social norms which influence mobility of women to participate outside the household economic activities like cooperatives. Participation of women in dairy cooperatives not only enhance economic condition of women but also influence household nutrition, education of children and healthcare of family members.

3.2 Introduction

A large database from household surveys from 89 countries reveals that the extreme poor, living below \$ 1.9 per day, are predominantly from rural areas and up to 64% of these poorest people are employed in agriculture (World Bank 2016). Contribution of smallholder agriculture to reduce poverty especially in developing countries is highly depending upon the sustainable access to markets (Wiggins and Keats 2013). Market participation is important for smallholders to access to inputs as well as to sell their products (IFAD, 2010). Market participation is defined as ability of an individual to participate in market effectively and efficiently to increase production (Poole 2017). Access to inputs will increase productivity whereas access to output markets will help rural farmers to connect with urban population to increase their income through reducing transaction costs (Bernard et al. 2010; Narrod et al. 2009). In this study, participation covers individual involvement in dairy cooperatives and evaluation of the outcomes (positive/negative) of involvement.

From 1970 to 1996 Operation Flood was the biggest poverty reduction programme in India, which has transformed the Indian dairy sector from a dairy products-importing country to an exporting country. This programme has followed dairy cooperative movement, which helped rural dairy producers to connect with urban consumers. However, participation in these dairy cooperatives and access to benefits were not uniform across different categories of members. Even though women play a vital role in the dairy sector of India with 71% of the labour contribution in livestock sector (Singh, Avinashilingam, and Malik 2012), their representation in dairy cooperative membership and leadership are limited (Cunningham 2009; Rajendran and Mohanty 2004). Women's roles in dairy production are multi-faceted but are not valued and acknowledged (Basu 2009; Daftary 2015; Patel et al. 2016). Only 18% of registered dairy cooperative members were women and only 3% of women were board members (Gupta 2000).

Women often face greater barriers than men in accessing agricultural markets to sell their produce and access to inputs and services to increase their productivity and income (Peterman et al. 2010; World Bank; FAO; IFAD 2009; World Bank 2011). There is vast literature on determinants of participation in cooperatives especially in African countries, which indicate that the poorest and women are often excluded from cooperative membership (Bernard and Spielman 2009; Fischer and Qaim 2012; Fischer and Qaim 2014). Development initiatives

through agricultural commercialization and market linkage have positive influence for household nutrition and welfare (von Braun 1995). As men, women and youth within household have different preferences for allocation of household income, market linkages will have different impact on household members depends upon their roles and responsibilities within household. Women 's inability to participate in cooperatives will have negative effects on household nutrition as women often care for household food security (von Braun 1995). However, increased participation is not always translated to positive outcomes for women, the impact of participation depends on circumstances. For example, participation can raise the economic status and change household roles, which could add social pressure from in laws and end up violence by the intimate partner (Naved and Persson 2005; Tabbush 2010). On the other hand improvement in economic condition of women can decrease the intimate domestic violence which is reported in Bangladesh (Schuler et al. 2013) Furthermore, the other negative aspect of women participation is addition of high workloads especially if other household roles and chores don't change (Kabeer 2005; Quisumbing, Meinzen-Dick, et al. 2014).

Despite the known fact that the gender is a key determinant of participation in cooperatives (Bernard and Spielman 2009; Fischer and Qaim 2014; Meier zu Selhausen 2015; Rani and Yadeta 2016), a thorough exploration of various factors which determine women's participation in cooperatives is still missing. Furthermore, there is dearth of information in India whether policies focusing on allotment of women quota in dairy cooperatives have facilitated or supported women's control over dairy income. There is dearth of information for the factors that determine women's control over dairy income from dairy cooperatives.

The above statement indicates that a knowledge gap exists with regard to socio-economic and socio-cultural factors and their influence on participation of women in cooperatives, control over income. Therefore, the aim of this study was to identify the socio-economic and socio-cultural factors at household as well as community level, which influence the participation of women in dairy cooperatives and their control over dairy income in Bihar and Telangana, India. This study is guided by the following research questions.

- a. What are the factors that determine women's participation in dairy cooperatives and control over dairy income in households?
- b. What are the barriers at household, community and organizational level affecting women's participation in dairy cooperatives?

c. What are benefits for women participating in dairy cooperatives?

3.3 Conceptual framework for determinants of women's participation in cooperatives and their benefits

Figure 3-1 presents a conceptual framework that hypothesized the factors which influence the levels of participation of women in cooperatives and their control over dairy income. The following section provides an overview of the literature, defining participation and different levels of participation, as well as the impact on control over dairy income. This will be followed by providing an overview how household, community and organizational level factors influence women's participation and access to or control over income, and what are potential benefits of participation for women participating in cooperatives.

3.3.1 Defining participation and their levels

Participation has been categorized into various levels based on the involvement of an individual into group activities. For this study participation levels defined by (Agarwal 2001) in the context of community forestry in South Asia seems more appropriate. Agarwal, 2001 has divided participation of individual in collective action into 5 levels: 1) nominal; 2) passive; 3) consultative; 4) activity specific; 5) interactive. These are defined by intensity of participation where nominal is least participation limited to membership, next level is passive where members are informed of decisions, consultative where members are asked for any opinion, activity specific means members are given some tasks and interactive participation is considered as the highest level of participation where members have voice and influence decisions. In dairy cooperatives, participation can be divided into nominal membership, attending meetings for decision making, trainings for capacity building and electing the leaders through voting and leadership roles. For this study membership is considered as nominal participation whereas participation in meeting, training, voting and leadership roles are considered as active participation (Fischer and Qaim 2014), which brings changes in decision making within households and community level. The benefit or impact of association with cooperatives are strongly depending upon the level of involvement or participation within cooperatives, for example nominal participation lead to lower benefits for individuals (Woldu et al. 2013).

3.3.2 Determinants of women participation in cooperatives and control over dairy income

Recent dairy development policies in India have reserved quotas for women membership in village dairy cooperatives. However, it still has to be investigated whether participation of women in dairy cooperatives really translates into positive benefits within household such as control over dairy income. A recent study in women's dairy cooperatives in Karnataka indicated that membership did not benefit women's empowerment (Dohmwirth and Hanisch 2017). Women's empowerment is defined by World bank as the process of enhancing the capacity of individuals or groups to make choices and to transform those choices into desired actions and outcomes⁵. Equal participation of men and women in cooperatives can lead to benefits not only to members, but also to their families. For example, a study in Nicaragua found that the percentage of children attending primary school was higher when their mothers participated and benefitted in fair trade coffee cooperatives (Bacon 2010). Many mixed (either men or women) membership cooperatives in developing countries allow only one member of the family to participate in cooperatives often women are excluded (Pionetti, Adenew, and Abadi 2011; World Bank, FAO, and IFAD 2008). When markets are formalized women are often excluded from formal markets due to having less rights to land, livestock and income from formalized markets (Carr and Chen 2004; Njuki et al. 2011). When women leave cooperatives, their control over dairy income is undermined (Kristjanson et al. 2014).

Determinants of women's participation in cooperatives and control over dairy income are presented below at household, community and organizational levels.

3.3.3 Household level factors

Access to resources: Bargaining power of the individual to participate in the market depends upon the basic resources such as land and livestock (Agarwal 1997). Land ownership positively influences individual participation in cooperatives because land is prerequisite to participate. It is also evident in agricultural cooperatives in Africa where male domination exists (Abebaw and Haile 2013; Bernard and Spielman 2009; Meier zu Selhausen 2015). For dairy cooperatives, livestock ownership also plays key role in circumstances where land is not directly influencing the participation. Generally, cooperative membership is given to household head because of land ownership (land title). There is clear distinction for the land ownership through land title ownership but this is not evident in the livestock ownership. This

⁵ <http://go.worldbank.org/V45HD4P100>

is either followed through the inheritance or through purchase. There is a need to understand the local context of livestock ownership rather than identifying the livestock ownership. For this study, we used livestock ownership defined by (Galiè et al. 2015) into seven domains like benefitting from the livestock, how livestock was sourced, decision making, caring for the animals, knowledge of resources, having full authority over livestock and carrying the responsibility. In livestock ownership, control and decision making about these resources is of equal importance which subsequently affect the market participation.

Education: Various studies found that lack of education and training opportunities influence women's self-confidence which subsequently affect participation in cooperatives (Kaaria et al. 2016; Kebede 2011; Woldu et al. 2013). Education level is important to understand the level of discussion in meetings and discussions concerning the productivity enhancement. A study found that farmers with primary and secondary education are more likely to participate in farmer field schools than illiterate farmers in Kenya (Davis et al. 2010). Coleman and Mwangi (2013) assessed women's participation in forestry groups in Bolivia, Kenya, Mexico and Uganda and found that chances of women participating in groups increased with number of years in schooling. Uneducated women often hesitate to speak in public meetings due to lack of recognition and confidence (Agarwal 1997). However, one study found that education was not a factor to influence membership (Meier zu Selhausen 2015). Therefore, it is important to evaluate the role of education and knowledge in production and influence on participation and control over benefits.

Previous experience to collective action: It is evident from the literature that women access to membership or actively participating in producer organizations often had previous experience working with economic or savings groups (Baden 2013; Kaaria et al. 2016). It indicates that the women having prior experience are more likely to participate.

Household work burdens: Women contribute to household activities more than men (Doss 2013, 2018). The multiplicity of roles of women in households in caring for children, elderly household members, as well as for animals, reduces their time to participate in meetings and trainings of cooperatives. It subsequently reduces their chances to become members and receive benefits in these cooperatives (Kaaria et al. 2016; Kebede 2011; Tanwir and Safdar 2013). Women in developing countries work on average 16 hours per day (Carr and Hartl 2010; Tanwir and Safdar 2013) and the opportunity cost to participate in producer organizations are higher than for men due to household work burden (Mayoux 1995).

Furthermore, childbearing and breastfeeding responsibilities of women hinders their participation in these group activities (Quisumbing and Pandolfelli 2010).

Intra household power relations and decision making: Different members in the household have different preferences, interests and ability to achieve their interests. Access to resources like land and livestock does not automatically bring social and economic change (Calás, Smircich, and Bourne 2009), but it depends upon the ability of women to take decisions and to gain control over these resources, which is referred to as agency (Kabeer 1999) and bargaining power (Agarwal 1997). These are greatly influenced by education, local knowledge and experience. Lower participation of women in coffee cooperatives in Ethiopia is due to the lack of decision making power within households (Woldu et al. 2013). Becoming voluntary members in mixed cooperatives indicates the bargaining position of women and reflects women's physical movement and freedom to participate. Women with high number of male children indicate reproductive bargaining power which is an early indicator for participation in cooperatives. Women's decision making within household also depends upon the social norms and social capital (Agarwal 1997). Social capital is defined as networks together with shared norms, values and understandings that facilitate co-operation within or among groups⁶. A key principle for improving the decision making power of women is formation of self-help groups and building their confidence through skills training, helping them to join formal cooperatives for wider socio-economic impact (World Bank et al. 2008).

3.3.4 Community level factors

Social and gender norms: Social and cultural norms refer to sets of beliefs about men's and women's capabilities and skills, defining their access to public spaces and how they should behave in these spaces (Kaaria et al. 2016). The restrictions on women to access to public places affect their bargaining power within and beyond household level. Women are seen as being responsible for child care, house work such as preparing food and cleaning, collection of fuel, fodder and water, whereas men are responsible for production work and income generation (Agarwal 2001; Kaaria et al. 2016; Tanwir and Safdar 2013). In Asian and African countries, participation of married women in public sphere activities such as self-help groups or cooperatives is not allowed without their husband's permission or support (Gotschi, Njuki, and Delve 2009). However, market participation will help to overcome these restrictions and change these norms by making women more confident and economically empowered.

⁶ <https://www.oecd.org/insights/37966934.pdf>

Mobility: In developing countries, women are often not allowed to travel outside their home and village. Distance to main roads negatively correlated with participation of members in group activities in farmer field schools and cooperatives in Kenya, Tanzania and Uganda (Davis et al. 2010; Fischer and Qaim 2012b). Increased participation of women members was reported when the cooperative members are from the same locality, as it is reported for coffee cooperatives of Ethiopia (Woldu et al. 2013). In Bangladesh, participation in dairy cooperatives increased the mobility of women outside their community (Quisumbing, Rubin, et al. 2014)

Caste: Caste refers to a traditional Hindu model of social stratification, which defines people by ancestry and occupation (Berreman 1960). It is defined as a system of ordered inequality both in status and access to goods and services. Among the different castes in India Brahman, Rajput are forward case (FC) which is considered as higher caste with high social status; Dalit or Scheduled Caste (SC), Adivasi or Scheduled Tribes (ST), Backward caste and Muslim are considered as lower castes with low level of jobs like daily wage laborers (Fatima Alvi 2016). Women from lower caste households have more opportunities to participate than women from higher caste households as they are already participating as laborers. However, women from Muslim communities have less chance to participate in economic activities (Fatima Alvi 2016).

3.3.5 Organizational factors

Organizational environment: Two categories of organizational factors influence, motivate and enable participation of women and men in producer organizations. One category is organizational environment, which includes membership criteria, leadership, management, organizational structure and support for capacity development. At the organizational level, clear goals and proactive coordination towards transformation encourages women participation (Smith 1994). For example, in Bangladesh, community based organizations were found successful due to better governance structure and specific quota to encourage women to become leaders (Datta 2007). Strong leadership and reservation quota for women in membership and training encourages participation of women in the dairy cooperatives (Kumaraswamy et al. 2014). Women tend to be associated with cooperatives when there is satisfaction for increased control over technologies and input services (Woldu et al. 2013).

3.3.6 Political factors

Policies and legislations, which address issues such as access to resources (land, income) without any discrimination against women, will encourage women's participation in collective based organizations (Kaaria et al., 2016). In Uganda due to lack of legal implementations for women to access to land led to low participation in producer organizations (Najjingo, Sseguya, and Mangheni 2004). Another barrier to participation is the upper caste dominance, especially in South Asia. In countries like India policies with regard to dairy development are influenced by the upper caste through political lobbying which hinders the participation of lower caste individuals in cooperatives (Basu and Chakraborty 2008).

3.3.7 Beneficial impact of women's participation in cooperatives

Review of good practice case studies of producer organizations by (Herbel et al. 2012) found that participation in producer organizations resulted in various benefits for members of these organizations, among others enhanced access to resources, information, inputs and output markets. This study analysed the benefits achieved by women through participating in cooperatives at two levels: 1) benefits at household level; 2) benefits at community level.

3.3.7.1 Household level benefit:

The major benefit at the household level is increased income from sale of products or increased productivity due to improved knowledge, access to networks, and opportunities. Nominal participation of women in dairy cooperatives will not result in empowerment of women, as empowerment largely depends on active participation (Dohmwirth and Hanisch 2017). Some literature suggests that commercialization of market will give control over income to men if gender inequalities in participation are not addressed (Fischer and Qaim 2012b). Women access and control over income from cooperatives not only empowers them but also helps to achieve food security and family welfare (Quisumbing, Rubin, et al. 2014). On the other hand, men tend to invest in productive assets and businesses (T Ravichandran, Teufel, and Duncan 2016). Other benefits of women participation in cooperatives are changes in decision making and improved negotiations skills within household, which are evident in households associated with these cooperatives in Uganda (Ferguson and Kepe 2011). Key change due to participation in cooperatives is asset ownership, which is reported in Bangladesh where joint asset ownership was found increasing due to participation of women in cooperatives (Quisumbing and Roy 2014).

3.3.7.2 Community level benefit:

The most important changes at community level due to women's participation in producer organizations are increased social capital. Some dairy groups in Bangladesh built social and human capital and changed society's perception of women's roles and capabilities (Quisumbing et al. 2015). It also led to increased mobility and communication (Quisumbing and Roy 2014; Ravichandran, Teufel, and Duncan 2015) which are the key components of women empowerment. Building self-confidence and leadership skills through participation in collective-based organizations are evident in self-employed women's associations of India, contesting the existing patriarchal and hierarchical norms within society (Chen 2006).

All the above determinants of women's participation in dairy cooperatives are outlined in following framework (Figure 3-1). It is important to note that household, community and organizational factors are interlinked and influence each other.

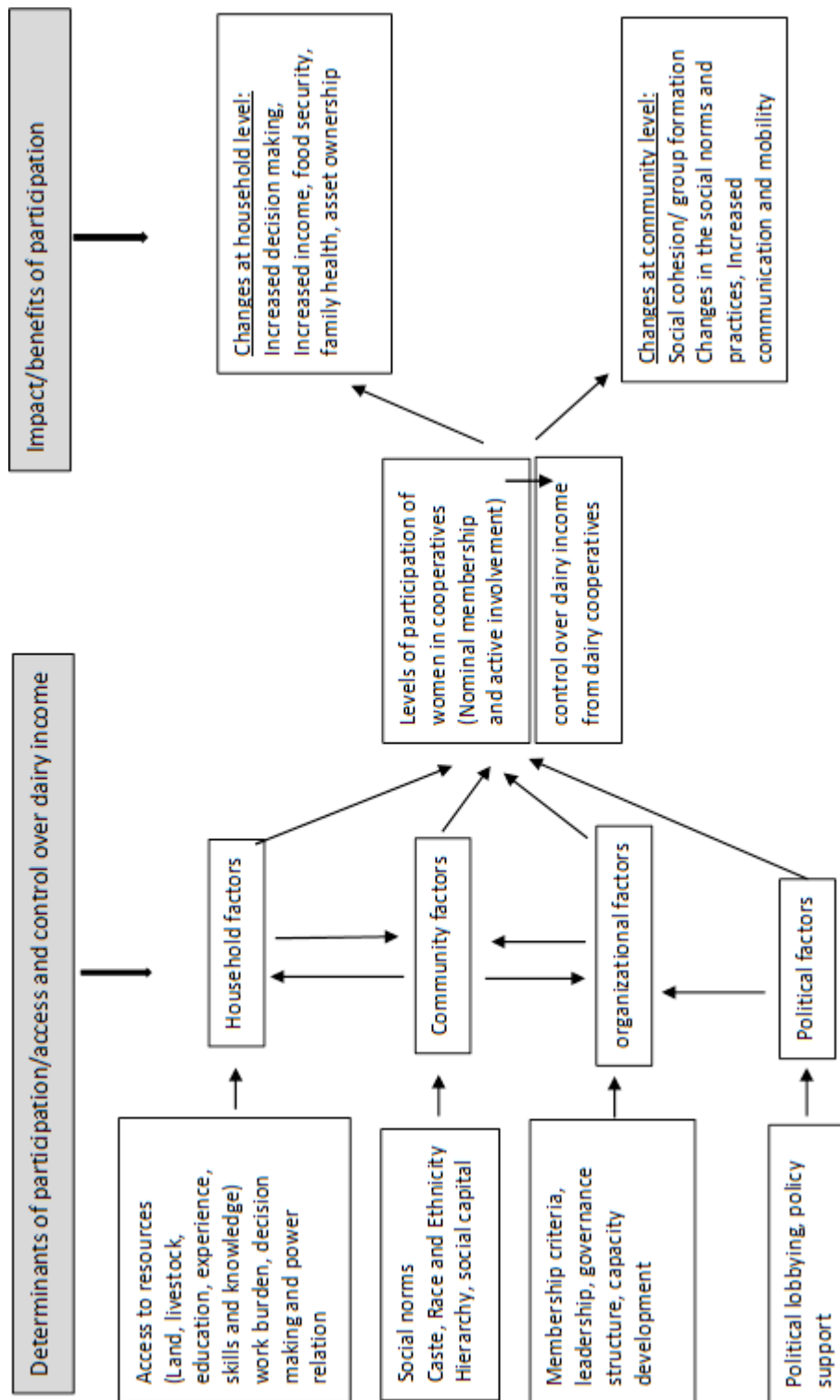


Figure 3-1 Factors influencing women’s participation in cooperatives and access to and control over dairy income and impact on livelihood

Source: Author

Study design and data collection

A qualitative explorative research approach was used in this study. The aim of qualitative research is to contextualize the findings in the interactive world in which they are generated (Denzin and Lincoln 2013). It is difficult to perceive the difficulties faced by farmer by staying far from the field or through spending few minutes with them to perform a survey. Therefore, it is important to be in the field to understand the behaviour and explore reasons behind their behaviour (Chambers 1983). Grounded theory procedures (Glaser and Strauss 2009) were used to develop theories that provide explanations for individuals participating in the dairy cooperatives or control over dairy income and possible reasons for their behavior. Each study has a specific index of time, space, culture and situation. Theories generated are evaluated as “plausible accounts” (Charmaz 2006: 132) rather than as objectively verifiable. This study used few sensitized concepts (Bowen 2006) based on conceptual framework to develop open questions from where researcher started to discuss with individuals for their behaviour on participation in dairy cooperatives.

3.3.8 Ethnographic stay for data collection

As the study required in-depth information on participation of women in dairy cooperatives, the researcher used ethnographic methods for data collection. Here, the researcher used institutional ethnography (Smith 2005) to understand women’s and men’s standpoint for their participation in the dairy cooperative. A deeper understanding of problems or constraints associated with women participation in the institutional process were explored in their day-to-day life and assessed how these are embedded in the social relations. Ethnographers discover what people do before assigning meaning to their behavior and beliefs. This helps to generate the theory based on local contexts. The initial idea or concept, named formative theory, was developed through focus group discussion with producers, which was further investigated through the semi-structured interview while staying in the villages.

Semi-structured interviews (n=153) with open-ended questions to facilitate further explorative discussions were used to collect data related to participation in dairy cooperatives. The household semi-structured interview consisted of a set of open questions which are compiled below:

1. Who is member in dairy cooperative from household and why she or he became member?

2. Who takes decision on breeding, feeding, treatment, purchase of animals and credit sourcing and why?
3. Who receives the dairy income within household? Who decides for spending the dairy income? How the dairy income is spent?

The above questions were directed to get detail information from each household about the relevant factors at household, community and organizational levels which influence the individual behaviour towards dairy cooperative participation and access to control over dairy income. The last question supported to get information on how the dairy income is being spent by men and women.

Some of the participants were also observed for their activities and roles around dairy enterprise to explore their behaviour. Furthermore, the researcher participated in dairy cooperative monthly meeting (n=2) and events (best dairy cow n=1) related to dairy cooperatives. There were some challenges to interview women in presence of their husband as they were reluctant to answer some questions. The researcher avoided the interview when women are with their husband to avoid the bias in answers. Sometime leading questions were asked to explore the reasons for certain behaviour.

3.3.9 Sampling strategy

The study included different membership cooperatives such as women-only membership and mixed membership. This study assessed two dairy cooperatives in Telangana: 1) Telangana Women Dairy Cooperative (Tel–WomDC) with membership being limited to women: 2) Telangana Mixed Dairy Cooperative (Tel–MixDC) with mixed membership. In Bihar, two dairy cooperatives were included: 1) Bihar Mixed Dairy Cooperative (Bih–MixDC), mixed membership, 2) Bihar Women Dairy Cooperative (Bih–WomDC), women-only membership.

In Bihar, the researcher first approached Bihar dairy cooperative head office in Patna to know area of their operation for milk collection. The officials of dairy cooperatives facilitated for selection of two villages. In Telangana the researcher interacted with head of market channel to select representative village. The selection of villages was based on the dominance of the milk marketing channel verified through dairy cooperative milk collection records. In each selected village, all producers sell their milk through only one dairy market channel mentioned below (Table 3-1). The producers were informed about the objective of the study and consent has been agreed for keeping confidence of producer name and other details. The

interview with each individual lasted for one hour to 90 minutes and sometimes there were repetition of interviews to validate the information and doubts.

Criteria for selection of households for ethnographic interviews were based on size of land (small (<2 ha), medium (2-4 ha), and large (>4 ha)), number of dairy animals, quantity of milk sale and caste. With help of dairy cooperative secretary, special cases were included like widow women and women who talk bold, and benefitted from dairy cooperative etc. Initially, 10% of households were selected based on the above criteria to achieve diversity in data. Sampling was stopped later when no new information was received. Table 3-1 shows the distribution of the study sample in Telangana and Bihar. From each household either men or women or both were interviewed. In total 153 households were included in this study.

Table 3-1 Milk collection, membership and individual interviews in Telangana and Bihar dairy cooperatives

Type of village	Milk collection/ day	Total membership	No. of persons interviewed		
			Men	Women	Both
Tel-Women Dairy cooperative	1200	250	23	23	1
Tel-Mixed dairy cooperative	1000	200	18	18	0
Bih-Women dairy cooperative	1500	250	6	24	7
Bih-Mixed dairy cooperative	2000	300	14	16	3
Total number of households			61	81	11

3.3.10 Data entry and analysis

To determine the level of men and women dairy producers' participation in dairy cooperatives and control over dairy income, a descriptive analysis was carried out to generate percentages and means. Analysis of variance (ANOVA) and Chi-square were used to test for differences in means and proportions, respectively. Ethnographic interviews, minutes of meetings and observations were entered into Excel and Word. These files were transferred to ATLAS.ti (Scientific Software Development GmbH). These documents were coded initially with open coding. These open codes were further categorized based on similarities and differences based on guidance from conceptual framework. Important quotations from each household for the above categories were noted and also included in the results to illustrate the findings.

3.4 Results

3.4.1 Levels of participation of women in dairy cooperative and income control

In this section, results from all the four selected cooperatives from Telangana and Bihar will be presented. According to membership rules, Telangana women dairy cooperative has made

it mandatory that all the cooperatives at village level to be women only. There are 21,000 women members are registered from 105 villages. Telangana mixed dairy cooperatives do not have any rules for members, both women and men can become members at village level. Bihar dairy cooperatives have made mandatory rule that 30% of village dairy cooperatives to be women only and rest for mixed membership.

Level of participation of women in dairy cooperative is reported in Table 3-2, which includes the details of membership, participation in training, meeting, voting and leadership roles). It is interesting to note (number of registered women members in mixed member dairy cooperative. However, it was largely dependent on the area. For example, that there were 21% registered women members in Bihar mixed dairy cooperative whereas no women were members in Telangana mixed dairy cooperative. When women were asked for their opinion regarding membership especially from Telangana mixed dairy cooperative village, they said:

“Even though women want to become member, dairy cooperative don’t have provision for the women to become members, they consider only men as member and this is being followed for last 30 years” (Case 16, women, Tel-MixDC)

Table 3-2 Levels of participation of women in dairy cooperatives

Participation indicators	Type of dairy cooperative	Total interviews	Men%	Women%	Both%	None%
Nominal membership	Tel-WomenDC	48	0	100	0	0
	Tel-MixedDC	35	100	0	0	0
	Bih-WomenDC	37	0	100	0	0
	Bih-MixedDC	33	79	21	0	0
Participation (Training)	Tel-WomenDC	48	0	55	13	32
	Tel-MixedDC	35	3	0	3	95
	Bih-WomenDC	37	5	57	8	30
	Bih-MixedDC	33	36	24	3	36
Participation (voting and meeting)	Tel-WomenDC	48	0	87	0	13
	Tel-MixedDC	35	28	0	0	72
	Bih-WomenDC	37	0	25	0	75
	Bih-MixedDC	33	36	44	0	18

Regarding participation of dairy cooperative training, the outcomes of the study indicate that more women participated in women only cooperative of Telangana and Bihar (55%, 57%, respectively) than in mixed dairy cooperatives. Women from Telangana women dairy cooperative reported that there is flexibility of timings for the women to participate in trainings and meetings, as most of the meetings are conducted after 11am or 3 pm to allow women to finish their household work. It is interesting to note that among the mixed dairy cooperatives, 24% of women participated in Bihar mixed dairy cooperative but not in

Telangana. It was reported that women had to travel far to participate in meetings and also fixed timings were not helping either because women had more work at home.

While considering active involvement of women in dairy cooperative meetings and election, highest participation of women (87%) was recorded from Telangana women dairy cooperative for election and meetings. On the other hand, only 25% women were reported to participate in meetings and voting from Bihar women dairy cooperative. But there is interesting finding that 44% of women from Bihar mixed dairy cooperative reported that they participate in voting and meeting (They reported that women can participate in meetings) even though they are not members.

In case of women participation in leadership roles, the study found female leadership in positions of secretary and chairman at village level in Telangana and Bihar women dairy cooperatives (Figure 2-1 and Figure 2-4). On the other hand, men were found in leadership roles in mixed dairy cooperatives in both states (Figure 2-2 and Figure 2-4). It was interesting to note that women were acting as shadow leaders especially in Bihar women dairy cooperative where their husbands were responsible for all decision making and payment roles. Many women reported that

“even though chairperson and secretary are women in this dairy cooperative, their husband does all decisions so other women don’t have a voice to express opinion”
(women from Bihar women dairy cooperative)

On the other hand, women were found as leaders at all villages and union level and management level in Telangana women dairy cooperative.

3.4.2 Women control over dairy income

It will be interesting to see if women only membership directly benefits women control over dairy income. It is interesting finding that 87% of women from Telangana women dairy cooperative reported that they have control over the dairy income. On the other hand, only 49% of women from Bihar women dairy cooperative had control over the dairy income within household level. Among the mixed dairy cooperatives, 27% of women had access to control over dairy income in Bihar, and only 6% of women in Telangana mixed dairy cooperative even though none were members and participated in any meetings or trainings. Another interesting aspect to note in Telangana mixed dairy cooperative is that 30% members interviewed mentioned that women and men together within household control their dairy

income (Table 3-3). It is interesting women are jointly involved in control of dairy income even though there are not nominal membership in dairy cooperatives.

Table 3-3 Women’s control over dairy income

Type of dairy Cooperative	Total	Men%	Women%	Both%
Tel-WomenDC	n=48	4	87	9
Tel-MixedDC	n=35	64	6	30
Bih-WomenDC	n=37	43	49	8
Bih-MixedDC	n=33	64	27	9

3.4.3 Qualitative perception of respondents on factors influencing women’s participation in dairy cooperatives and control over dairy income

Reasons stated by men and women why women face difficulties for participation in dairy cooperatives are illustrated in Table 3-4.

Most important factors reported by respondents were grouped according to household, community and organizational factors. Most influencing factors for women to become member in dairy cooperative were women’s position within household (16%) to take decision which is based on her social status like household’s elder women, first daughter in-law, household head, educated etc. and cooperative membership rules like women only membership (15%) (Table 3-4). Among the access to resources, education (12%), experience and knowledge (10%) were reported to influence in next level. Land ownership was not reported as an influencing factor for women in dairy cooperative membership. Household work burden and lack of mobility were reported as hindrance for becoming members in dairy cooperative. One interesting quote from man about his wife’s nominal membership in dairy cooperative and distance of milk collection centre that

“My wife is not a member in dairy cooperative, because the dairy collection centre is located 2 km away from this village and we have to cross the river which is not possible by her and she can’t travel to nearby town to attend any training, that is the reason I have become as member” (Case 17, Man, BihMixDC).

Among the organizational factors good leadership, better input support, good governance, and membership rules were reported as important for women to become members (Table 3-4), This is evident in Bihar mixed dairy cooperative where few women said:

“We joined in dairy cooperative as members due to motivation of secretary, he always encourages women to participate in meetings and training program” (case 4,15,20, women, BihMixDC)

Social norms like ‘cash to men and labour to women’ and ‘women are ATM’ were found to be frequently mentioned by men which indicates dominance of men over control of income. These quotes indicate that social norms of gender roles influencing for women membership in dairy cooperatives. Women reported that migration of men to other places for job (4%) facilitated women to become members in mixed cooperative.

Regarding factors influencing women control over dairy income, household and community factors were reported the leading factors (Table 3-4). It is interesting to note that women’s position within household (20%) was reported as most influencing constraint for women’s participation in dairy cooperatives followed by education, knowledge and experience and dominance of men (17% all) within household. In many household, men are considered as household head and automatically considered as receiver of benefits from dairy cooperatives. In some households, women’s position to take decision within household is defined by their education level, health status and number of children. A detailed interaction with a woman whose husband is controlling dairy income revealed that she has not been respected within household by his mother-in-law and husband as she gave birth to 6 girls in search of boy kid. She perceives that women are submissive within household. When there are more kids, there is no chance for market activities. Education is considered an important factor because it is required for calculation of expenses, decision for feeding, breeding and purchase of animal. In some other households, the factors which were reported to decrease the women’s access to dairy income were lack of good health (10%), lack of other income sources (9%) and household work burden (5%). Land ownership was considered as least important factor for women participation dairy cooperative membership and control over dairy income (Table 3-4). Women opinioned that land is common to household, it does not matter who owns the land within household.

Table 3-4 Frequency of constraints

Themes	Constraint for participation		Constraint for control over income	
	frequency *	Ranking	frequency *	Ranking
<i>Household level factors</i>				
Women position within household	13	1	16	1
Lack of education	10	3	14	2
Lack of experience and knowledge	8	4	14	2
Lack of mobility	7	5	-	-
Household work burden	6	6	4	7
Lack of support from men/dominance of men	5	7	14	2
Lack of good health	3	8	7	6
Lack of land ownership	1	9	1	10
Lack of income	-	-	8	5
<i>Community level factors</i>				
Social norm: cash to men labour to women	-	-	10	3
Lack of social capital-SHG, networking	1	9	9	4
Migration of men facilitate women	3	8	7	7
Caste	-	-	2	9
Social norms: women act as ATM	-	-	3	8
<i>Organizational % political factors</i>				
Lack of policy support	3	8	-	-
Lack of good leadership	3	8	-	-
Lack of access to inputs and services	3	8	4	7
Rules of membership	12	2	-	-
Governance challenges	5	7	7	6
Total respondents	81		81	

*Multiple answers are possible by same person

(Source: semi-structured household interview)

Apart from household factors, social norms and community factors also influence the women control over income. There is common social norm such as cash to men and labour to women (12%), which affects women access to dairy income. Women expressed that social capital through self-help groups and membership influenced their access to dairy income (11%). Organizational factors were least influencing women access to income except governance challenges.

3.4.4 Quantitative analysis of determinants of participation of women in dairy cooperatives: membership and control over dairy income

While analysis of quantitative variables for household factors, it was found that the outcomes supported the perception of farmers. The statistical analysis confirms that household factors land size, number of dairy animals and quantity of milk does not influence women's membership and control over dairy income. The correlation between number of trainings attended by women and their participation in membership and control over dairy income was statistically significant (Table 3-5). The data shows that on average 2.9 and 3 days of training of women influenced the membership and control over income within household. The number of

school years attended by women does not affect membership but it is highly associated with control over dairy income. The women who were found to control the dairy income had an average of 4.3 schooling years compared to 3.8 schooling years for men.

The results showed that gender roles such as milking and delivering the milk to dairy collection centre also statistically influenced the membership and control over dairy income (Table 3-5). Other factors such as decision making within household for milk sale, treatment, breeding, feeding and purchase of animals ($P < 0.0001$) also statistically influenced the membership and control over dairy income.

Among the social factors, the statistical analysis confirms that women participation in Self-Help Groups (SHG) influences the membership and control over dairy income (Table 3-5). Among the membership, 64% of women members were associated with SHGs and 81% of women who control dairy income were associated with SHG. Caste was important social factor, which has significant influence on both membership and control over dairy income. Interesting to note women from lower caste were participating more as well as controlling dairy income. Among lower caste, scheduled tribes and scheduled caste of 58 households, women were 69% in membership and 57% of women control dairy income. On the other hand, women from higher caste households (Forward caste) were less participative either in membership (34%) or in control over income (27%).

Table 3-5 Determinants of women participation in dairy cooperative membership and control over income

Independent variable	Dependent variable			
	Who is cooperative membership?		Who controls dairy income?	
Quantitative variable	F-Value	P<[F]	F-Value	P<[F]
Land size	2.71	0.12	1.19	0.305
Education (schooling years)	1.38	0.241	8.78	0.009
No of training attended by women	46.75	0.0001	14.3	0.0001
Milk yield/day	3.52	0.062	4.62	0.01
No. of cows	0.27	0.601	1.9	0.153
No. of buffaloes	0.26	0.605	1.83	0.163
Qualitative variable	χ^2 -value	P < [χ^2]	χ^2 -value	P < [χ^2]
Social membership (SHG, Farmer's groups)	155.7	0.0001	177.2	0.0001
Organizational rules	271.6	0.0001	199.4	0.0001
Caste	168.7	0.0001	174.0	0.0001
Who milks	155.8	0.0001	16.67	0.0001
Who delivers milk	169.2	0.0001	174.0	0.0001
Who decides milk sale	154.7	0.0001	164.5	0.0001
Who decides breeding	156.5	0.0001	164.1	0.0001
Who decides treatment	155.7	0.0001	160.6	0.0001
Who decides feeding	158.2	0.0001	169.1	0.0001
Who decides purchase animal	156.6	0.0001	158.5	0.0001

Organizational factors such as membership rules for women only or mixed member criteria have influenced statistically both membership and control over dairy income ($P < 0.0001$). Women only cooperative rules facilitated women to become member and access and control over dairy income.

3.4.5 Influencing factors for decision making within households which affects participation

This section details on who decides on which issues and the factors which influence decision making within household level. Results had shown that women were dominating in the decision making about quantity of milk to be sold outside and how much needed for household consumption. This trend was similar both in Bihar and Telangana (Table 3-6). Decisions on the credit sourcing is equally taken by both men and women at the household level in all village cooperatives. In the decision on feeding and selection of fodder crops, there is mixed observations in all the four types of cooperatives. There is domination of men in making decisions for breeding, treatment and purchase of animals (65-90%) in all four villages of Bihar and Telangana (Table 3-6). Some important social norms mentioned by men and women for decision on breeding, treatment and purchase of animals are:

Social norms: “household work is by women and outside work is by men”; “Heavy work by men”; “women don’t communicate with other men”; “knowledge to men, labour to men”

Table 3-6 Decision-making power within household for dairy animal

Decision indicators	Type of dairy cooperative	Men%	Women%	Both%
Milk sale	Tel-WomenDC	11	68	21
	Tel-MixedDC	0	84	6
	Bih-WomenDC	19	76	5
	Bih-MixedDC	18	64	18
Breeding	Tel-WomenDC	79	6	15
	Tel-MixedDC	78	6	17
	Bih-WomenDC	81	11	8
	Bih-MixedDC	67	18	15
Feeding and fodder crops	Tel-WomenDC	34	17	49
	Tel-MixedDC	58	3	39
	Bih-WomenDC	32	43	24
	Bih-MixedDC	27	52	21
Treatment of animal	Tel-WomenDC	81	4	15
	Tel-MixedDC	61	14	25
	Bih-WomenDC	81	8	11
	Bih-MixedDC	64	18	18
Availing credit	Tel-WomenDC	53	47	0

	Tel-MixedDC	54	46	0
	Bih-WomenDC	54	43	3
	Bih-MixedDC	36	45	18
Purchase or selling animal	Tel-WomenDC	87	0	13
	Tel-MixedDC	100	0	0
	Bih-WomenDC	92	0	8
	Bih-MixedDC	76	15	9

Apart from gender norms, some other factors were mentioned which influence the decision making are grouped in the following Table 3-7. Social and cultural restrictions such as women are not allowed to go outside and restriction on women communicating with unknown men were considered as strong influencing factors for women involvement in breeding and purchase of animals. Most of the service providers for breeding, treatment of animals and purchase of animals are men, which act as a strong barrier for women to be involved in these decisions (Table 3-7). Lack of knowledge and negotiations skills were reported as strong influencing factors for the purchase of animals. Men reported that women do not know how to assess animal and their price. Lack of training was reported as moderate factor for feeding, treatment and breeding. Some exceptions are seen in Bihar, low caste households where women reported that they take the decisions regarding breeding and treatment and there is no cultural or social barrier for outside movement.

Table 3-7 Factors which influence decision making on livestock management

Influencing factors	Decision making on			
	Breeding	Purchase animal	Treatment	Feeding
Lack of mobility	√	√	√	√
Lack of knowledge (price and market)	√	√√√	√√	√
Lack of education			√√	√√
Lack of communication skills		√		
Lack of socialization	√	√√	√	
Mostly service provider are men	√√√	√√√	√√√	
Distance		√	√	
Lack of exposure/awareness	√	√		√
Household burden, no time		√	√	√
Lack of motivation/preference	√	√		
Social and cultural restrictions (women not allowed outside work; Restriction to interact other men, breeding by men)	√√√	√√√	√	
Safety reasons	√√	√√	√√	
Lack of access to mobile/media	√		√	
Lack of access to training	√√	√	√√	√√
Lack of negotiation skill	√	√√√	√	

√√√- Strong influence √√- Moderate influence √- low influence

3.4.6 Role of land ownership and education for participation of women in dairy cooperatives

Both men and women mentioned that ownership of land did not influence the membership in dairy cooperatives and control over dairy income. However, few mentioned that it acts as an indirect influencing factor within household. Men mentioned that land ownership helps them to avail the credit from bank, reduces the feed cost for animals and influence the decision-making power within household. However, it indirectly affects the women participation in dairy cooperatives (Figure 3-2). Whereas women expressed that there is low bargaining power within household decision when the ownership is with men. Furthermore, ownership also increases social respect, build confidence and help in credit sourcing. (Figure 3-3).



Figure 3-2 Opinion of women on the role of land ownership for participation of women in dairy cooperatives

(N=57)



Figure 3-3 Opinion of men on Land ownership about participation of women in dairy cooperatives

(N=69)

On the other hand, men and women expressed how education affects the participation in dairy cooperatives. Results had shown that 28% of interviewed women said that education

influences their bargaining power within household and as well as decision making (Table 3-8). The next important aspect mentioned that education helps them to build practical knowledge, social respect, facilitates in accounting, training, increases confidence and improves communication skills. On the other hand, men opinioned that education most importantly helps them in decisions and as well as in animal management (24%). They said that educated persons can learn technical knowledge such as feed, disease aspects (21%), which is very important in dairy farming.

Table 3-8 Influence of education on participation in dairy cooperatives

Themes mentioned (education and cooperative participation)	Respondents			
	men		Women	
	Count	Rank	Count	Rank
low-bargaining-power	16	1	2	7
influence-decision	16	1	8	1
influence-membership	8	2	7	2
practical-knowledge-important	8	2	5	5
build-confidence	7	3	-	-
influence-benefits	7	3	3	6
influence-training	6	4	1	8
manage-milk money	6	4	5	5
influence-communication	5	5	6	3
influence-animal-management	5	5	8	1
social-respect	5	5	-	-
improve-governance	4	6	1	8
no-influence	4	6	2	7
disease-feed-knowledge-important	3	7	7	2
influence-mobility	2	9	1	8
maintain-bank-accounts	1	9	2	4
influence-leadership	1	9	-	-
information-sharing	1	9	-	-
Total respondents	58	-	34	-

3.4.7 Impact of women participation in dairy cooperatives

Household level: It is interesting to see gender analysis on how the dairy income is spent within household. There is statistical significance difference among women and men expenditure pattern, women spent more than men on household food expenses, health care of family members and education of children. Among the expenditure patterns from dairy income, priority of women was SHG savings (59%), payment of school fee (53%) and agricultural inputs (44%) (Table 3-9). When men control dairy income, they spent more than women in areas of agricultural inputs (65%), and less on savings and school fee (31%) and loan repayment (26%).

Community level: There was interesting feedback from women on benefits of cooperative participation. They expressed that participation not only increased income but also improved social capital, communication, knowledge on management of animals and increased leadership roles. There is change in the social norms that “cash for men and labour for women”; the labour work is shared by men when women attend meetings and training. There was observation in Telangana women dairy cooperative village that men cleaned sheds and took care of kids when women went for meeting or training outside village. Women were allowed by their husbands to handle cash due to increased knowledge and confidence among women. There is increased mobility of women outside village when they become members in dairy cooperatives, which is evident in Telangana and Bihar women dairy cooperative.

Table 3-9 Spending of dairy income by women and men

How dairy income is spent *	Who controls the income Nos			χ^2 -value	P-value
	Men	Women	Both		
Food expenses	14	24	4	157.14	0.0001
Healthcare family	6	21	6	162.79	0.0001
Agricultural inputs	40	31	8	161.20	0.0001
School fee	19	37	15	166.73	0.0001
Clothes	6	7	1	154.57	0.0001
Asset building	6	17	6	160.07	0.0001
Savings	19	41	14	167.62	0.0001
Loan repayment for animal	16	25	6	155.58	0.0001
Total respondents	62	70	21		

*Multiple answers were possible for expenditure pattern.

3.5 Discussion

3.5.1 Critical factors to enhance women’s participation

The first and foremost determinant of participation is gender inequality. At present, the gender issues exist at different levels from household to community caused by different factors, which subsequently affect women participation in dairy cooperatives. This study indicated some major factors which contribute towards lower participation of women in dairy co-ops as compared to men include: 1) lack of institutional arrangements for women to participate like women only cooperatives; 2) underrepresentation of women in leadership roles and decision making in dairy cooperatives; 3) social and cultural norms; 4) lack of social capital; 5) lack of education and knowledge. This Current study has found varying degree of women participation at different levels such as nominal membership, participation in trainings, meetings, voting as well as leadership roles. However, on large scale, cooperatives fail to maintain gender equality, which contradicts the basic principle of cooperatives

“voluntary and open membership: open to all”. It is especially relevant for developing countries where greater gender inequality exists in all spheres of life (Nippierd 1999). In the following section, all the factors influencing women participation and control over dairy income in dairy cooperatives will be discussed one by one.

Lack of institutional arrangements for women to participate: Currently, there are very few women only cooperatives, which directly facilitate the women to become member in cooperative and control over dairy income from participation. Women constitute half of the population in the world making them to participate in all development initiative is important for sustainable development. If there is high gender inequality within society then there will be no opportunity for the women to participate in cooperatives. Women-only set up could be one possible solution of this issue. However, this study found that there are other characteristics which encourage their participation in the cooperatives. For example, one interesting aspect with Telangana mixed dairy cooperative, even though women were not found as nominal membership in cooperatives but their involvement in meetings and voting and control of dairy income is evident. This indicates that women can benefit from dairy cooperatives even though she is not as nominal member. Most of the meeting were at village level where women taken part and the income were spent jointly within household. It is difficult to generalize because women participation in Bihar mixed dairy cooperative for training, meeting and voting were highly correlated with nominal membership.

Some other factors which facilitated women participation were flexibility in timings of meeting and training, nearest training location and women extension agents or staffs for easy communication. The mixed cooperatives are not very supportive and limit the role of women. However, there is interesting finding from Bihar mixed dairy cooperative that 24% of women were participated in training but none in Telangana mixed dairy cooperative. One possible explanation for high participation of women in trainings in Bihar mixed dairy cooperatives is encouraging environment. In Bihar, a male secretary who always encouraged and facilitated women to participate in all levels, and thus promoting shared governance (Gardiner 2006). Findings from this study support the hypothesis that proportion of women in active participation (training and decision making meetings) are proportionately associated with women in leadership positions (Nakazi et al. 2017).

Women in leadership roles: In current organizational structure, women are not given leadership opportunities in mixed dairy cooperatives. The participation of women in

leadership and managerial roles are observed only when the cooperative is reserved for women from village to union level not just with membership at village level. Bihar women dairy cooperatives follow the shadow women managers (Birner 2010) and their role is insignificant. Their husbands are the main decision-makers which discourage other women to participate actively in cooperative women find it difficult to communicate with men due to cultural norms which restrict the women to discuss with outside men. Women as shadow manager issue is mainly due to the organizational governance structure implemented by government which follows top down approach only a few villages for women only cooperatives just for the sake of reservation and political lobbying. Secondary literature search indicated that there are only 3% women as board members in dairy cooperatives in India (Gupta 2000).

Social and cultural norms: Secondary data sources indicate that there are only 18% women members in dairy cooperatives in India (NDDDB 2015). The other reason of low participation of married women is household burden and non-supportive husbands, who do not allow their wives to participate in public spheres (Gotschi et al. 2009). Often women's roles are limited to household work such as child care, elder care, cleaning work, feeding and care of sick animals, whereas men deals with the public relations (Agarwal 2001; Kaaria et al. 2016; Tanwir and Safdar 2013). Women face social and cultural constraints to communicate with dominant male service providers which limits their access to breeding, treatment and extension services. Same results were reported in other study that women participation is limited in breeding, animal health and feed purchase decisions (Pandey, Modi, and Sharma n.d.). This is more obvious in higher caste households (forward class and other backward class) than lower caste (Scheduled caste and Scheduled tribe). Poorer the families, higher the contribution of women labour in dairy animal management, which gives way for more decision making power as men migrate to other places for daily wages (George 1991). This subsequently leads to women from lower caste, the poorer households to have more economic autonomy and bargaining power within the households than higher caste women (Krishnan 2005). But their participation in meetings, elections is very low due to governance issues where political lobbying by upper caste is very common. This is in line with the previous findings that upper caste households lobby with dairy development officials for gaining benefits (Basu and Chakraborty 2008). Women friendly policies can be evaluated when there is significant participation of women from lower caste in leadership positions (Clots-Figueras 2011).

Collective action to contest social norms: Collective actions and participation in market organizations help women to contest the social norms, which restrict their access to inputs and services (Agarwal 1997). The findings of current study are in line with previous literature that even though women are more likely to be associated with social groups than men, the proportion of women in leadership and managerial positions are limited (Agarwal 2001; Quisumbing, Rubin, et al. 2014; Rani and Yadeta 2016). This can be contested if the women are allowed in leadership and managerial roles. For example, it is evident from the outcomes of this study, in Telangana women only dairy cooperative women were more comfortable in asserting their rights and contest the social norms when discriminated. In an environment where cultural barriers make it difficult for men and women to work together, women-only groups may be the most practicable way to promote their complete participation (Pandolfelli, Meinzen-Dick, and Dohrn 2008). A study of forest user groups in India and Nepal also strengthen this argument that increase in the proportion of women in leadership positions improves governance and resource sustainability (Agarwal 2009).

Social capital: Women who have social capital through networks with friends and non-relatives are found to have been more associated with organizational memberships. Furthermore, those nations which have more social trust among individuals have more organizational membership towards economic growth (Inglehart and Norris 2003). Social network and social participation are considered as important physical assets for women which provide them access to new technologies and build asset portfolio of women in the long run (Niketha et al. 2017; Quisumbing and Kumar 2011). Promotion of women based self-help groups are increasing in India to facilitate socio-economic improvement (Lahiri-Dutt and Samanta, 2006). These self-help groups and access to membership organizations serve as important grounds for women to build their leadership skills (Horowitz 2009). This finding contested the previous finding in Karnataka women-only dairy cooperative where less empowerment of women was observed and where the inclusion of women in governance structure is limited only to membership due to top down approach (Dohmwirth and Hanisch 2017). However, this finding supports the previous argument that inclusion of women just as members in cooperative does not help their development without their inclusion in planning and implementation of cooperative governance (Cunningham 2009; Rajendran and Mohanty 2004).

Education and knowledge: Another important factor reported in this study which influences women's participation in dairy cooperatives is lack of education or knowledge. Women in this study perceived that education is important for bargaining power within the household as it builds knowledge and improves the confidence. Women from Haryana dairy cooperative also reported that education is important constraint for women in dairy cooperative (Yadav and Indu 2012). Education contributes towards gaining information and helps to participate in labor market and provides alternate income sources (Seebens 2011). It subsequently improves position of women within household. Female seclusion is practiced in communities with low levels of literacy (Gotschi et al. 2009). Lack of education negatively influences women's self-confidence; uneducated women are generally not vocal in public. It is mainly because women have fear that their opinions will not be equally reflected, leading to poor participation of women in producer organizations, which is also reported in forestry groups in Bolivia, Kenya, Mexico and (Coleman and Mwangi 2013). Education level and entrepreneurial skills/experience were considered as elements of women's participation in agricultural cooperatives in Ethiopia (Bernard and Spielman 2009) as well as in Costa Rica (Wollni and Zeller 2007). Current study provided evidence that women who have attended many training sessions got control over dairy income despite being illiterate. This concludes that training and capacity building to enhance knowledge of women will influence their participation in dairy cooperatives and contest the barrier of illiteracy.

Land ownership: More interesting finding in this study is that land ownership and size of the land was not considered as an important factor for gender participation for membership in dairy cooperatives and access and control over dairy income which contest the previous arguments that land ownership is important determinant for women participation in cooperatives. Previous literatures have reiterated that women are often omitted to join cooperatives in cases where land ownership is a pre-requisite for access to membership for example agricultural cooperatives (Agarwal 2001; Bernard and Spielman 2009; Meier zu Selhausen 2015; Pandolfelli, Meinzen-Dick, and Dohrn 2005). However, in case of dairy cooperatives land is not directly associated with participation. This is in line with previous literature that dairy cooperative membership is not influenced by who owns the land (Basu and Chakraborty 2008). This is because land is not considered as membership criterion in dairy cooperatives.

Based on the findings of above discussion, it can be concluded that gender inclusive governance structure from village level to management level facilitates better participation of women in membership, training, meeting, election and leadership roles. Furthermore, gender inclusive policies are needed which will contribute towards easing the burden and capacity building of women for better productivity of animals in the absence of men.

3.5.2 Impact of participation of women in dairy cooperatives

Participation of women in market organizations bring various benefits for women empowerment and wellbeing of family (Basu and Chakraborty 2008; Dohmwirth and Hanisch 2017; Kaaria et al. 2016). Agricultural cooperatives support women for collective bargaining power and improving the individual capacities to enhance their income (Woldu et al. 2013). However, this study found that nominal membership, as in case of Bihar women dairy cooperatives, does not benefit women (access and control over dairy income) significantly. Contrary to it, active participation of women at all the levels such as training, meeting and leadership role, resulted in more control over dairy income within household, and hence more benefits, as seen in Telangana women only dairy cooperative. This is in line with the previous finding that involuntary or forced membership of women in dairy cooperatives indicates weak bargaining power of women within the household, and leads to control over income by men. It is mainly because men fear that their position of breadwinner is lost (Dohmwirth and Hanisch 2017). Support of men within the household for participation of women in dairy cooperatives will give more access to dairy income which is evident in Telangana women dairy cooperative. Another interesting finding is that women have more access to income in women-only cooperatives than in mixed (either men or women) cooperatives.

The present study conflicts with a previous study in Karnataka dairy cooperatives where men control the dairy income from women dairy cooperatives as the payment were given to men and women became members due to force (Dohmwirth and Hanisch 2017). Possible explanation for the difference in the present study is that payment rules are strict in Telangana women dairy cooperatives and the person who receives money tends to have more control over decisions on expenditures from that income. While considering the bargaining power and gender inequalities within the households, payment rules must be strict to benefit women.

It is important to analyze how the dairy income is spent within the households to see impact of women participation in dairy cooperatives and for the wellbeing of households. Women who control the dairy income tend to spend more on savings, school fee, household nutrition,

food security and health care of family members. On the other hand, men tend to spend their dairy income for agricultural inputs, savings and repayment of loan. These findings are in line with previous literature which stated that participation of women in cooperatives benefits household members in terms of food security, education, healthcare, nutrition, housing and clothing (FAO 2011; Fischer and Qaim 2012b; Kebede 2011).

This study provided evidence that participation of women in dairy cooperatives increased their communication, mobility and social capital. Social norms which limit the mobility of women can be contested through active participation in economic organizations like cooperatives (Agarwal 2001; Quisumbing et al. 2015) . Group membership is an important source of social capital which provides empowerment itself as a source of information and inputs. There is a likelihood for spillover of benefits or technologies even to non-member women if there is a strong social network within the village (Janssens 2010; Subedi 2014).

Positive changes in gender relations due to women participation in dairy cooperatives were evident in this study, especially in Telangana women dairy cooperative, where men were found to support women for control over income and to spare household work to facilitate women to participate in dairy cooperatives. This is due to perceived benefits by men from dairy cooperatives and due to inclusion of men in meetings and trainings. Secondary data records indicated that the quantity of milk sold by Telangana women dairy cooperative increased five times in the last 10 years. There is a need for efforts to dismantle structural barriers of gender inequality within the household through better alliance with men to mobilize them for new organizational innovations for women engagements in economic movements (Conrwall, Harry, and Mbyyiselo 2011).

3.6 Conclusion

The most important gender issues in dairy cooperatives at present are poor level of participation of women and their underrepresentation in leadership roles and decision making. Using the ethnographic data collected from mixed and women-only dairy cooperatives in Bihar and Telangana, this paper contributes to existing literature for determinants of women's participation in dairy cooperatives at different levels.

First, the study assessed the levels of women's participation in dairy cooperatives such as membership, meetings, trainings and leadership roles. After a thorough analysis, this study concludes that an active participation of women is possible when enabling environment and

gender inclusive governance structures are present at all levels, beginning from villages to higher management levels. When gender inequality and imbalance are very high within the households and at community levels, which prevent men and women to work together, gender inclusive policies, such as women-only set up, are good options for short term benefits; mixed cooperatives can be the long-term solution till the underlying gender issues are addressed. This women-only set up should not be limited to cooperative membership and leadership at village level, but it should be extended at management and union levels to create many women leaders to bring a positive change in policy and organizational culture so as to address women's needs.

Second, the study explored the determinants of women participation in membership and access to dairy income. Education and knowledge level play an important role within the household for the bargaining power and decision making of women which affects the level of participation of women in dairy cooperatives. Training and capacity building of both partners will improve the bargaining power of women and change the mindset of men to support women participation in cooperatives and training modules should be formulated to address gender issues. Social networking through self-help groups and participation in cooperatives plays an important role to build the confidence of women to contest the social norms which prevents their mobility and participation in economic activities.

Third, the findings of this study indicate that women participation in cooperatives not only enhances women's access to income and social capital but also improves wellbeing of the whole family. Overall, the findings imply that centrally planned reservation policies in cooperatives are being subjected to state interference and mask the need of women, and therefore, cooperatives should experience gender inclusive independent planning and implementation. Opinion and perceptions of the respondents to explain the factors influencing their participation in cooperatives require strong relationship and trust with the researcher which was possible through ethnographic survey employed in this study. Further, a study is required to compare the economic efficiency of women-only dairy cooperatives, mixed dairy cooperatives and informal market to inform the development partners and policies for areas of investment. In addition, this study must be extended in other livestock production systems, especially with small animals, to investigate the specific gender issues.

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4 Stimulating smallholder dairy market and livestock feed innovations through local innovation platforms in the Himalayan foothills of India

4.1 Abstract

Innovation platforms (IP) are increasingly used in agricultural development as a way to address complex issues which require diverse actors to work jointly to identify constraints and implement solutions. Assessment of their impact and identification of factors responsible for success are important if performance is to be optimized. This study assesses the impact on smallholder dairy production and marketing of a series of innovation platforms in Uttarakhand, Northern Himalayan region, India. We studied the link between innovation platform mechanisms and impacts using systematic documentation of meetings and interventions along with a post-intervention impact assessment which compared treatment and control households. We found that the households participating in IPs showed increased dairy income, increased milk sales and improved breeding and feeding practices. Factors influencing these impacts were the process of issue identification, diversity of actors participating and quality of follow-up on the agreed action plans.

Key words: Innovation platform; dairy; feed innovation; market

4.2 Introduction

India is the largest milk producer in the world with an 18% share of world milk production and milk production has been growing at an annual rate of 4.2% for the last 2 decades (USDA 2017). Dairy sector growth has been based on continuously rising demand from the domestic market due to increases in population, income growth and urbanization (Delgado 2005). Even though the share of agriculture in GDP is declining, the contribution of livestock to agricultural GDP has increased from 20% in 1988-89 to 26% in 2015-16 of which 70 % comes from the dairy sector (NDDDB 2016). Based on these emerging opportunities in the dairy sector, there is considerable scope for the poorest sectors of the population to enhance their livelihood since 80 % of dairy animals in India are owned by households with less than 2 ha of land (NSSO, GoI 2013)⁷. Dairying is the major source of rural employment especially for women. Income from dairying has an levelling effect on the distribution of income for all classes of farm households compared to distribution of income arising from crop production (Mandal et al. 2010).

Dairy sector growth is not equally distributed across different states (Ohlan 2012a). Uttar Pradesh, Rajasthan, Punjab, Maharashtra and Andhra Pradesh are the top 5 states accounting for more than half of the milk production in India. Eastern and hilly states are minor contributors to the dairy sector. Uttarakhand is one such hilly state with slow dairy growth of 2.7%. Most of the dairy animals in this state are kept on mixed crop-livestock farms. Dairying is the second most important livelihood source after arable agriculture with nearly every household owning one or two dairy animals. There are two major constraints for dairy development in this region. Distance to market negatively influences the participation of dairy farmers in the market (Bardhan, Sharma, and Saxena 2012). 39% of villages are not directly connected to roads and people have difficulty walking 3-5 km to reach a metaled road due to challenging terrain (Mehta 1999). The other major growth constraint is low productivity caused by lack of access to high quality feed. Most dairy farmers in Uttarakhand follow a sedentary production system, stall feeding their animals with fodder collected from forest areas (60%) and grassland (3.7%) (Sati 2016). A previous study in Uttarakhand indicated a nutritional deficit of 19-27% to meet the standard nutrient requirements of dairy animals (Jarial, Kumar, and Padmakumar 2013) and that feeds were deficient in both energy and

⁷ http://www.mospi.gov.in/sites/default/files/publication_reports/nss_rep_572.pdf?download=1

protein concentrations (Tiwary, Pandey, and Tiwari 2010). There is only a limited market for concentrate feed in this hilly region due to high transaction costs. The para-statal Uttarakhand Cooperative Dairy Society, also known by its brand-name Aanchal, is the only major formal milk marketing channel in this region, despite its limited productivity and inactive societies in many villages (Sati and Panwar 2017). Another general issue in this region is outmigration of men due to non-farm income opportunities outside the state (Mamgain and Reddy 2016). Most of the dairy activities are therefore carried out by women in this region (Bhoj et al. 2014).

Based on the success of the Operation Flood programme in Gujarat, dairy cooperatives were established in Uttarakhand in the 1990s by the State to promote farmers' market access for sale of milk. Various technological interventions were introduced to enhance productivity including improved breeds of dairy cattle, artificial insemination, improved forages, concentrate feeding and animal health interventions such as vaccination and deworming. Despite the potential of these technological measures to enhance productivity, the adoption of these interventions has been very low in Uttarakhand (Rathod and Chander 2016) especially in hilly districts. Average milk volumes collected from cooperative members are around 0.3 litres/ day in hilly districts, compared to 1.6 litres per day in the plain areas of Uttarakhand. In the hilly regions, fodder scarcity is a serious concern. Livestock feed scarcity is a common constraint in low and middle income countries and many attempts have been made to promote food-feed crops, fodder trees, improved grasses and legumes (Thornton 2010). However, adoption of these technologies has been limited due to a range of well-rehearsed factors (Franzel et al. 2014; Kumar, Singh, and Misra 2015; Suman, Kumar, and Kumar 2017; Sumberg 2004). Often "technology push" approaches have been employed which disregard indigenous sources of knowledge and farmer demand (Lundvall et al. 2002; World Bank 2007).

Some have argued that fodder scarcity has less to do with information shortage than with a scarcity of "capacity to innovate" (Hall, Sulaiman, and Bezkorowajnyj 2007). Innovation capacity development can be addressed through development approaches which acknowledge the wider innovation system where innovation is seen as emerging from a network of public and private organizations, enterprises, and individuals whose interactions produce, diffuse and utilize knowledge which brings economic and social benefits (Lundvall et al. 2002; Spielman et al. 2008; World Bank 2007).

One means of building capacity to innovate is through the establishment of connections between key actors in a network to facilitate dialogue and change. Approaches to build such connections and networks include innovation platforms (IP) (Ayele et al. 2012; Homann-Kee Tui et al. 2013; Kilelu, Klerkx, and Leeuwis 2013a), public-private partnerships (Nissen, Evald, and Clarke 2014), multi-stakeholder platforms or collaborations (Reypens, Lievens, and Blazevic 2016; Warner 2006) or value chain collaborations (Ros-Tonen et al. 2015). Because innovation platforms do not require any formalized participation of public or private institutions, are focused on stimulating innovations and can consider both production and market aspects, this approach was followed to address market and productivity issues in Uttarakhand's dairy sector in the research for development project investigated by this study.

There have been many qualitative case studies to evaluate the impact of innovation platforms. These studies have found that innovation platforms can successfully facilitate institutional change (Hall et al. 2003; Nederlof and Mariana 2011), strengthen market relationships (Davies et al. 2017; Sparrow and Traoré 2017), increase capacity for collective action (Davies et al. 2017) and promote technology adoption (Pamuk, Bulte, and Adekunle 2014a). However, many of these studies were focused on limited elements of the approach; either on the impact side or aspects of IP facilitation and few if any have systematically assessed the impact of IPs on organizational and technical innovation and on measures of productivity. We hypothesize that the impact of IPs depends to a considerable extent on the processes involved in conducting these IPs. Impact can be achieved in innovation platforms through various measures which include negotiation, provision of resources or information, research, lobbying and advocacy (Duncan et al. 2013). The resulting impacts can also be manifold; some may be measurable, such as increased income and adoption of technologies, while some may be hard to measure, such as increased innovation capacity, increased communication and collaboration. In this study, we set out to identify the impacts of IPs on stakeholder behaviour and livelihood outcomes, to investigate the related processes within the IPs and, subsequently, to better understand how the effectiveness of IPs might be improved. The objective of this paper is to assess the impacts of the local innovation platforms at household and organizational level and the processes involved in IPs that led to these impacts. The research questions we addressed were:

- What are the impacts of IPs on institutional linkages, adoption of technologies and dairy productivity?

- What are the key processes of establishing and facilitating IPs that lead to positive impacts?

4.3 Methodology

The “MilkIT⁸” project was a research for development project funded by the International Fund for Agricultural Development between Nov 2011 and Dec 2014. The aim of the project was to contribute to improved dairy supported livelihoods in India and Tanzania through intensification of small holder production focusing on feed enhancement through the value chain and innovation approaches. In India, the project was implemented in the hill state of Uttarakhand and managed by the International Livestock Research Institute (ILRI) with implementation by two NGOs namely the Institute of Himalayan Environment Research and Education (INHERE) and the Central Himalayan Rural Action Group (CHIRAG). Selection of sites was designed to align with implementation districts of the Integrated Livelihood Support Programme (ILSP), a large IFAD loan programme of IFAD which was starting at the same time as MilkIT. Of the long list of districts selected for ILSP, Almora and Bageshwar districts were selected for MilkIT based on the extent of dairy activity and the experience and local integration of potential implementation partners.

4.3.1 Description of study sites

Uttarakhand, the Indian state in the Himalayas selected for this research, is characterized by subsistence-oriented mixed agriculture with dairy farming. Hardy local breeds and locally available feeds, such as hay and tree leaves collected from hill-sides, form the basis of resilient, yet low-productivity dairy production focused on home consumption. However, improved infrastructure and road connectivity in recent years has created opportunities for these farmers to link to larger markets and thus the potential to generate income from dairy farming (Sharma et al. 2007).

The study sites of Almora and Bageshwar districts are in the Kumaon division of East Uttarakhand with an average altitude of 1600 and 1000 meters respectively above sea level, a dry period from March to June, a rainy season from July to September and winter season from October to February. The average annual rainfall in these districts is 1014mm in Almora and 1331 mm in Bageshwar, forest cover accounts for 73% of which 30% is maintained by the

⁸ Full title: Enhancing Dairy-based Livelihoods in India and the United Republic of Tanzania through Feed Innovation and Value Chain Development Approaches (MilkIT)

community also known as Van Panchayat⁹ forest. Fodder collection from these community forests is the main source of feed for livestock in this hilly region. Both these districts have some arable land (10-20%) and a small areas of grass land (<5%) (Sati 2016)

Agriculture is the main form of livelihood in this hilly region and is dominated by subsistence cereal farming with low productivity (Sati 2005). Outmigration of men to nearby cities is very common to support family expenses (Mamgain and Reddy 2016). The dairy sector in these districts assumes greater importance because of limited livelihood options for rural households. Cattle constitute the major share of the livestock population in the state (44.6%) and milk accounts for about 77 % of total value of output from the livestock sector. Among the hill districts of Uttarakhand, Almora has the largest share of large ruminants, with 10.1% of the cattle and buffalo population, while 4.7% are being kept in Bageshwar. In both districts, adoption of crossbreeding is very slow. In Almora, only 4.3% of the cattle population is crossbred while in Bageshwar the figure is 0.5% (Pato, Shinde, and Tufani 2011). Many of the villages in these districts are far from paved roads making it difficult to access markets for selling milk. This has led to the formal urban markets being captured by private players from plain areas.

4.3.2 Establishment of IPs

In each district, one block¹⁰ was selected for project interventions, based on the existence of dairy production and marketing as well as of established development institutions for project implementation. Sult block was selected in Almora, and Bageshwar block in Bageshwar district. A village cluster approach was followed to select intervention and control sites for IP establishment. The definition of "village" is difficult in this area because farm households are dispersed, within small settlements. These settlements were recorded in a village census and then grouped (where appropriate) into mini-clusters (2-4 neighbouring settlements which can easily collaborate). Where possible, these mini-clusters were then grouped into mid-clusters (2-4 mini-clusters into one mid-cluster), representing a suitable activity area for a field facilitator and the potential basis of a livestock feed innovation platform. Selection of these mid-clusters for project interventions was based on road accessibility, number of dairy animals, self-help groups, interest in marketing milk and availability of feed.

⁹ Van Panchayat forests were formed in early 20th century, and allow the villagers to harvest important forest products like grass, tree leaves, leaf litter, timber and wood. They have a constitution for operational rules for the use and management of forest products.

¹⁰ Block is the sub division of a district for administrative and development purposes.

In each of the two blocks, 4 mid-clusters were formed with 2 being designated for IP activity (1 with good road access and 1 with medium road access) and 2 as control areas. The total number of households represented in these selected mid-clusters was 1244 from 21 villages. Feed innovation platforms were established in each mid-cluster selected for interventions. A milk marketing platform was formed in each block with contributions from the two mid-cluster feed innovation platforms (Table 4-1). The IP activity and control mid-clusters were in close proximity as depicted in Figure 4-1. An inventory mapping exercise was undertaken to identify the stakeholders involved in the dairy value chain in these two districts to ensure their inclusion in IP activities.

The main “treatment” in this project was the application of the IP approach. The main types of innovations agreed within the innovation platforms were dairy marketing arrangements and livestock feeding innovations. The control households did not receive any benefits from any other development programs except the standard government interventions which were similar in IP treatment and control groups.

Table 4-1 Details of villages selected for Innovation Platform activities in the study area, Uttarakhand

District	Name of Market IP (Block)	Name of Feed IP (mid-cluster)	No. of villages	Households
Bageshwar	Bageshwar	Saing	4	379
		Joshigaon	6	243
Almora	Sult	Saknara	6	379
		Barkinda	5	243
Total			21	1244

Source: Ravichandran et al., (2016: 153)



Figure 4-1 MilkIT project village mid-clusters, Uttarakhand

Names of mid-clusters: 1-Barkinda; 2-Saknara; 3-Gahnaheet; 4-Nailwalpali; 5-Sainj; 6-Joshigaon; 7-Chouganchina; 8-Khabra)

4.3.3 Design to evaluate the IPs

In this study, we evaluated IPs as an intervention strategy at two levels:

- IP functioning and process
- Outputs and outcomes at value chain and household level

IP functioning and processes were evaluated based on key indicators developed by the project team including chronology of activities, inclusiveness and diversity of members who participated, prioritization of issues, qualitative organizational or technical changes over time and a log of follow-up actions. These indicators were assessed based on data collected at IP-meetings and through follow-up documentation.

The impacts of IP activities at household and value chain level were measured using indicators such as changes in marketing strategies, rate of adoption of technical innovations, increase in dairy productivity and benefits, changes in household food consumption patterns and changes in institutional engagement. These were collected through an impact assessment survey explained below.

4.3.4 IP-meeting and follow-up documentation

Three types of meetings were organized. Firstly, core meetings were held every 3 months for both dairy value chain and feed IPs involving a wide range of stakeholders including producers and non-producers. Between these core meetings, follow-up meetings were held on an ad hoc basis in the villages as required. The third type of meeting was the individual meeting where MilkIT staff met with a specific individual or institution. In addition to these meetings, exposure visits and trainings were organized based on needs emerging from the IP-meeting discussions.

The innovation platform activities were summarized through systematic documentation after each IP-meeting. Data were collected in four categories: meeting identification, details of issues discussed, researcher observations and participant details. Meeting identification included the type of meeting, venue, who was invited to the meeting, who facilitated the meeting and the duration of the meeting. Details of issues discussed captured the topics addressed, agreed actions and who agreed to take responsibility for agreed actions. In this way, the team captured the follow-up of agreed actions before the next meeting and updated IP participants at the beginning of the next meeting. Researcher observations documented the process followed, changes from the last meeting and what worked well in the meeting discussions. Finally, participant details captured the various characteristics of all participating actors, including gender and contact information. The document was updated after each meeting by the project team, and any changes in the village or at the institutional level were also captured and documented. The documentation was carried out from January 2013 to November 2014.

4.3.5 Impact assessment survey

Before the project started, two surveys were conducted. Firstly, a baseline survey was implemented in all households in both control and intervention villages including 1244 households. Data were collected on variables covering dairy animal population, production details and marketing linkages. Secondly, focus group discussions were conducted through the use of the Feed Assessment Tool (FEAST) (Duncan et al. 2012) in 6 control settlements and 6 IP settlements to collect data on existing feeding practices and availability of feed which helped to inform the strategies of the IPs.

At the end of the project, a post intervention household survey was conducted in 192 households spread across the 48 settlements. To avoid selection bias, settlements were first selected randomly among the IP treatment and control mid-clusters. A sample of 6 settlements was selected from each of the 4 mid-clusters so that a total of 24 settlements from treatment and 24 settlements from control villages was selected (Table 4-2). Four households from each settlement were selected randomly with 2 females and 2 males acting as respondents. The respondents from the control villages were asked whether they had attended any of the IP-meetings conducted. This was to assess any spill-over effects¹¹ of the innovation platform activities. The details of the household sampling are given in Table 4-2.

The post-intervention household survey was conducted from September to November 2014. The respondents were asked to respond on aspects of dairy production and income details, livestock owned, feeding procedures, breeding and health management, market arrangements for selling milk as well as crop and fodder details. Information on cropping patterns, income from dairy, improved practices of feeding, breed management, marketing of milk and changes in the consumption patterns was collected based on recall for the previous 12 months.

Table 4-2 Sampling of households for the impact assessment survey in Sult and Bageshwar

District	Block	Name of mid-cluster	Type of mid-cluster	No of settlements	No of households
Bageshwar	Bageshwar	Joshigaon	IP	6	24
		Sainj	IP	6	24
		Khabra	Control	6	24
		Chouganchina	Control	6	24
Almora	Sult	Barkinda	IP	6	24
		Saknara	IP	6	24
		Nailwalpali	Control	6	24
		Gahnaheet	Control	6	24
Total				48	192

4.3.6 Data analysis

The IP-meeting and follow-up documentation was analysed by simple descriptive tests. These were used to summarize the issues discussed, the diversity of actors participating, follow-up of the agreed actions and the timeline of interventions implemented.

For the impact assessment on productivity and livelihood benefits, the households from baseline survey were selected and matched with the post-intervention survey households for

¹¹ Control households participating in IP-meetings

further analysis to assess changes in key variables. Since there were differences between treatment and control mid-clusters which pre-dated the application of the IP-meetings, the study compared changes over time between the IP treatment group and the control group. Thus, the interaction of treatment and time was used to identify the impact of IP-meetings.

The first statistical model considered milk yield as the response variable and time and treatment as explanatory variables to test for productivity effects. The design factors ‘district’, ‘mid-cluster’ and ‘settlement’ were included, as they were assumed to contribute to the variation in the response variable. Farms where milk yields of zero were recoded both in 2012 and 2014 were excluded from the analysis. The model was as follows:

$$y_{ijklmn} = \mu + d_i + \tau_j + \lambda_k + (d\tau)_{ij} + (d\lambda)_{ik} + (\tau\lambda)_{jk} + (d\tau\lambda)_{ijk} + f_{i(k)l} + g_{i(k)lm} + e_{i(j)(k)lmn} \quad (1)$$

where y_{ijklmn} is the milk yield of the n-th farm in the m-th settlement in the l-th mid-cluster, in the i-th district, at the k-th time point with the j-th treatment, μ is the overall intercept, d_i is the effect of the i-th district, τ_j is the effect of the j-th treatment, λ_k is the effect of the k-th time point, $(d\tau)_{ij}$ is the interaction of district and treatment, $(d\lambda)_{ik}$ is the interaction of district and time, $(\tau\lambda)_{jk}$ is the interaction of treatment and time, $(d\tau\lambda)_{ijk}$ is the interaction of district, treatment and time, $f_{i(k)l}$ is the effect of the l-th mid-cluster within the i-th district at time k, $g_{i(k)lm}$ is the effect of the m-th settlement within the l-th mid-cluster and i-th district at time k, $e_{i(j)(k)lmn}$ are the residual error terms associated with y_{ijklmn} .

$f_{i(k)l}$, $g_{i(k)lm}$, and $e_{i(j)(k)lmn}$ were considered random effects. Heterogeneous time-specific variances and correlations were allowed for the two subsequent measurements in time on an individual mid-cluster, settlement and farm by using the unstructured variance-covariance structure. In addition, error covariance parameters were estimated separately for each treatment to adjust for heterogeneity of variance detected in residual plots. Hence, the following covariance-parameters were estimated: variances $\sigma_f^2(k=1)$, $\sigma_f^2(k=2)$, $\sigma_g^2(k=1)$, $\sigma_g^2(k=2)$, $\sigma_{e(k=1)(j=1)}^2$, $\sigma_{e(k=1)(j=2)}^2$, $\sigma_{e(k=2)(j=1)}^2$, $\sigma_{e(k=2)(j=2)}^2$ and correlations ρ_f , ρ_g , $\rho_{e(j=1)}$ and $\rho_{e(j=2)}$. Model assumptions, homogeneity of variance and normal distribution of residuals were assessed by the inspection of plots of ‘studentized residuals’. Scatterplots of residuals

versus predicted values and quantile-quantile-plots were used to assess homoscedasticity and normal distribution, respectively. The response variable was transformed by taking the fourth root as residual plots showed heterogeneity of variance and a right skewed distribution of residuals.

However, a certain spill-over effect of IP-meeting participation was observed, i.e. some households from control villages also participated in IP-meetings to some extent. Therefore, the approach in model (1), in which treatment was defined by village, was potentially unsuitable to discover an influence of involvement in IP-meetings on milk yield. Thus, the categorical treatment variable based on village classification was replaced by the frequency of actual IP-meeting participation, which had been recorded for each household. The differences in milk yield between the two time-points (Δy_{ilm}) were regressed on IP-meeting participation frequency. To correct the analysis for initial milk yields, the milk yields at the first time-point were included in the model as a covariate. A model of the following form resulted:

$$\Delta y_{ilmn} = \mu + d_i + \beta_1 y_{1ilmn} + \beta_2 x_{ilmn} + \beta_{3i} y_{1ilmn} + \beta_{4i} x_{ilmn} + \beta_5 y_{1ilmn} x_{ilmn} + \beta_{6i} y_{1ilmn} x_{ilmn} + f_{il} + \beta_{7il} y_{1ilmn} + \beta_{8il} x_{ilmn} + \beta_{9il} y_{1ilmn} x_{ilmn} + g_{ilm} + \beta_{10ilm} y_{1ilmn} + \beta_{11ilm} x_{ilmn} + \beta_{12ilm} y_{1ilmn} x_{ilmn} + e_{ilmn} \quad (2)$$

where Δy_{ilm} is the difference of milk yields at the end of the experiment in 2014 (y_{2ilm}) and milk yield at the beginning of the experiment in 2012 (y_{1ilm}) of the n-th farm, in the m-th settlement, in the l-th mid-cluster and the i-th district, μ is the common intercept, d_i is the deviation from a common intercept of the i-th district, β_1 and β_2 are the common slopes of a regression on the initial milk yield y_{1ilm} and IP-meeting participation frequency x_{ilm} , β_{3i} and β_{4i} are the deviations from the common slopes of the regressions on y_{1ilm} and x_{ilm} for the i-th district, β_5 is the common slope for a regression on the cross product of y_{1ilm} and x_{ilm} , β_{6i} are the deviations from the common slope of the regression on the cross product for the i-th district, f_{il} , and g_{ilm} are the random intercept for the mid-clusters and settlements, β_{7il} , β_{8il} , β_{9il} are the mid-cluster-specific random slopes for y_{1ilmn} and x_{ilmn} and their cross-product, β_{10ilm} , β_{11ilm} , β_{12ilm} are the mid-cluster-specific random slopes for y_{1ilmn} and x_{ilmn} and their cross-product, e_{ilmn} are the residual error terms associated with Δy_{ilmn} .

f_{il} , g_{ilm} , β_{7il} , β_{8il} , β_{9il} , β_{10ilm} , β_{11ilm} , β_{12ilm} and e_{ilmn} were considered as random effects with mean zero and variances σ_f^2 , σ_g^2 , $\sigma_{\beta_7}^2$, $\sigma_{\beta_8}^2$, $\sigma_{\beta_9}^2$, $\sigma_{\beta_{10}}^2$, $\sigma_{\beta_{11}}^2$, $\sigma_{\beta_{12}}^2$ and σ_e^2 . Correlations between random intercepts and slopes on the level of mid-clusters and settlements were allowed to make sure that parameter estimates are invariant to rescaling of the regressors (Piepho and Ogutu 2002). Residual analysis was carried out as explained in model (1).

Models (1) and (2) were fitted using the MIXED procedure of SAS software version 9.4. Model parameters were estimated by restricted maximum likelihood method (REML) (Littell et al. 2006). Random effects were tested for significance by likelihood ratio tests before the inspection of fixed effects. Non-significant random effects were removed from the model. Fixed effects were tested using sequential Wald-type F-tests. Denominator degrees of freedom in F-tests and standard errors for parameter estimates were adjusted using the method of Kenward and Roger (Kenward and Roger 1997). Non-significant terms were removed from the model. The factor levels of significant qualitative factors in model (1) were compared by using pairwise t-tests. Throughout the entire statistical analysis, a significance level of 5% was used.

Simple descriptive analysis was performed for adoption of technological innovations such as feeding troughs, fodder choppers and breeding improvements before and after interventions, post-intervention data were compared between control and IP treatment households and then compared with baseline data which were derived from the focus group discussions conducted using the FEAST approach.

4.4 Results

This section presents an overview of innovation platform (IP) functioning and efficiency and impact of IP's on institutional and technological innovations at value chain and household level during the study period of 24 months (Dec 2012 to November 2014) in both Sult and Bageshwar. Most of the differences were at block level rather than at mid-cluster level, so many of results are presented at block level while a few details are also given for mid-cluster level. The process of IP-meetings and interventions are presented first, followed by the impact of the IP approach.

4.4.1 Prioritizing issues in IPs

4.4.1.1 Initial prioritization

The initial key issue limiting dairy development in this hilly region identified during the IP process were the high marketing cost of dairy production due to scattered settlements and a shortage of feed. The Feed Assessment Tool (FEAST) which includes participatory qualitative discussion and quantitative household survey (Duncan et al. 2012) helped to identify the feed related issues and helped to see the feed constraints in a broader livelihood context.

Initial core meetings at block level helped to prioritize the issues for the IP to act upon. The following table highlights the type of meetings held in Sult and Bageshwar (Table 4-3). Follow-up meetings at mid-cluster and village level for feed and market related interventions were more frequent in Bageshwar than in Sult, as were training and institutional meetings.

Table 4-3: Summary of type of Innovation Platform meeting

Type of IP-meeting	Sult block (No. of meetings)	Bageshwar block (No. of meetings)
Market (IP core)	4	3
Feed (IP core)	2	2
Follow-up (market & feed)	53	149
Training/exposure	1	3
Institutional meeting	2	5
Total	62	162

Source: Ravichandran et al. (2016:154)

The issues most frequently discussed in initial meetings in both blocks by the farmers and other actors were market-related constraints including inaccessibility of villages to markets and the low milk price paid by the existing government dairy cooperatives. After the establishment of the market linkages to sell milk, other issues arose, such as feed and breed issues. Once IPs were established, feed related issues were dominant topics of discussion (Figure 4-2). Issues other than the dairy development such as self-help group (SHG) based issues and cropping-based issues were also discussed in the IP-meetings.

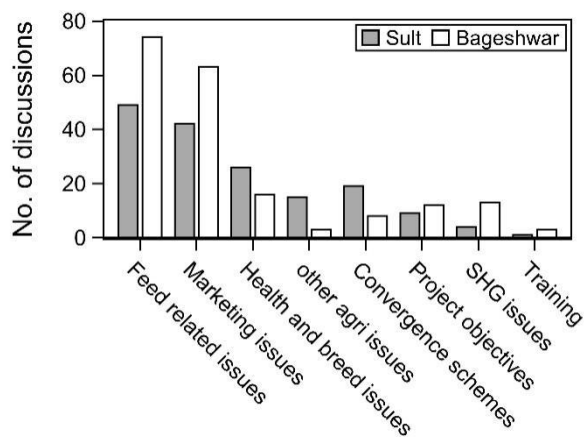


Figure 4-2: Details of issues discussed in initial IP-meetings

4.4.1.2 Changes in priority issues at IP-meetings over time

Comparing the priority of issues discussed in Sult and Bageshwar across the two-year period, the Sult IPs covered many issues in the first year, but feed and market related priorities were dominant (Figure 4-3). Health and breeding issues were also prominent. Farmers were concerned with government schemes such as subsidies because of the dry climate as mentioned under convergence issue in the figure. After the first year of IP establishment, IP members in Sult reduced their engagement in IP-meetings. This was due to an issue with Aanchal which delayed payment for milk. This demotivated many farmers and affected their willingness to participate in IP-meetings due to lack of confidence with IP agreed actions.

On the other hand, in Bageshwar, the IP covered issues evenly throughout the two years and feed and market related issues remained the main priority (Figure 4-3). Market issues were taken up continuously for 15 months which led to the formation of a SHG-based dairy cooperative, the establishment of rules of engaging with this dairy cooperative and the promotion of support services. Health and breeding issues were also prioritized for intervention, for example by initiating the training of Artificial Insemination (AI) workers and through veterinary health camps.

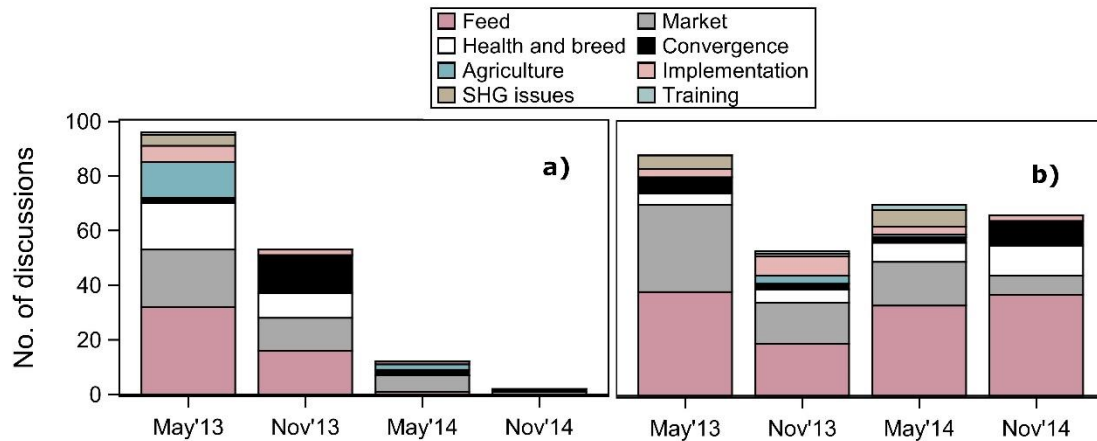


Figure 4-3 Temporal distribution of issues discussed in IP-meetings

a) Sult and b) Bageshwar

4.4.1.3 Follow-up of IP action plans

At the start of each IP-meeting, the follow-up actions formulated at previous meetings were evaluated. Follow-up of issues were analysed at mid-cluster level in Sult and Bageshwar (Figure 4-4). Issues were followed up more systematically in Bageshwar than in Sult. Within Sult, some mid-cluster level differences were observed: in Barkinda mid-cluster, follow-up was less comprehensive than in Saknara mid-cluster, even though there were more meetings in Barkinda. On the other hand, Sainj mid-cluster IP members were especially good in regularly following up issues and implementing the agreed action plans (Figure 4-4). The impact of follow-up is reflected in the impact of interventions and is presented in more detail in the following results on adoption of technical innovations and productivity enhancement.

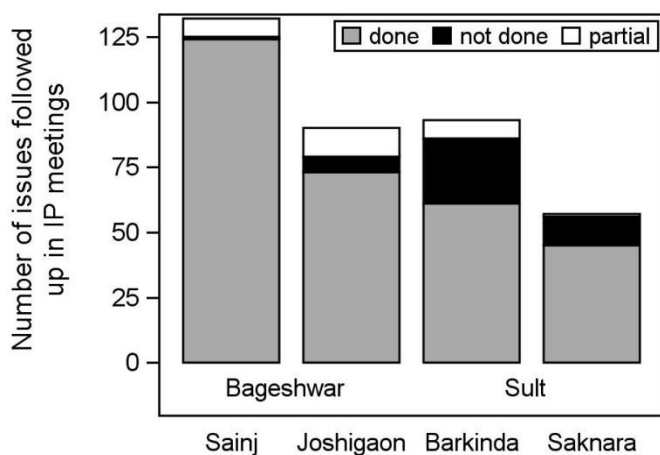


Figure 4-4: Follow-up of issues in IP mid-clusters

4.4.2 Participation in the IPs

4.4.2.1 Gender analysis of dairy producers participating

The IP-meeting records were analysed in both Sult and Bageshwar to determine who attended the IP-meetings. Women dominated attendance at the IP-meetings: in Sult, 72% of all participants were women, while in Bageshwar the corresponding figure was 81% (Figure 4-5), including some women attending more than once. More men participated in Sult (410) than in Bageshwar (244).

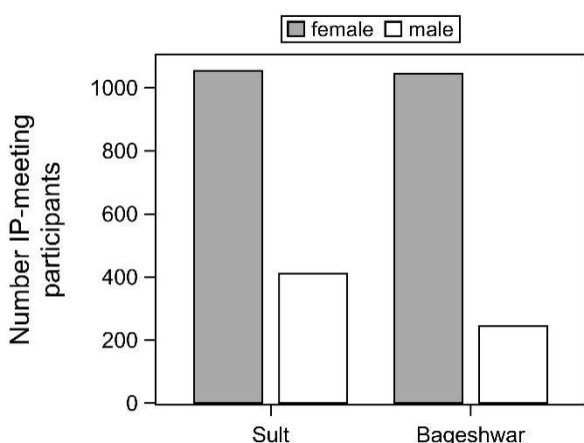


Figure 4-5 Gender analysis of participating farmers in IP-meetings

4.4.2.2 Diversity of non-producers in IP-meetings

At the beginning of the project, a stakeholder mapping exercise was carried out to identify the key stakeholders associated with dairy development in the study districts and at state level. Before the IP-meeting phase, the stakeholders were invited through formal invitation letters and through direct communication. The diversity of non-producer actors participating in IP-meetings was higher in Bageshwar than in Sult (Figure 4-6). Government officials were dominant in both blocks and these included Aanchal¹², banks, the Integrated Livelihood Support Programme (ILSP) by IFAD, the Agricultural Department, the Animal Husbandry Department, Krishi Vigyan Kendra (KVK)¹³ and the National Bank for Rural Development (NABARD). Initially, no private sector actors attended in either district although one private trader participated after 18 months of the IP-meeting intervention to discuss procurement of milk with farmers. Aanchal (the government-based dairy cooperative) actively participated in Sult over many meetings, whereas Aanchal did not participate in Bageshwar after the first two meetings once producers started their own SHG-based dairy marketing unit at district level to sell their milk, as the issues they experienced with Aanchal were never addressed. There was evidence of banking actors in Bageshwar but not in Sult due to the distance of villages from the head offices. An agricultural research and extension centre (KVK) is located in Bageshwar so its representatives participated in IP-meetings. NABARD, a national development bank, took the initiative to fund dairy farmers in Bageshwar after the first IP-meeting and also participated regularly in village meetings to identify beneficiaries. The impact of this participation is reflected in the Bageshwar interventions such as purchase of crossbred cows with high milk yield as explained below in the impact section.

¹² Aanchal is the government-operated dairy cooperative society in Uttarakhand

¹³ Krishi Vigyan Kendra are agricultural extension centres created by ICAR (Indian Council for Agricultural Research) and its affiliated institutions at district level to provide extension support to the agricultural sector

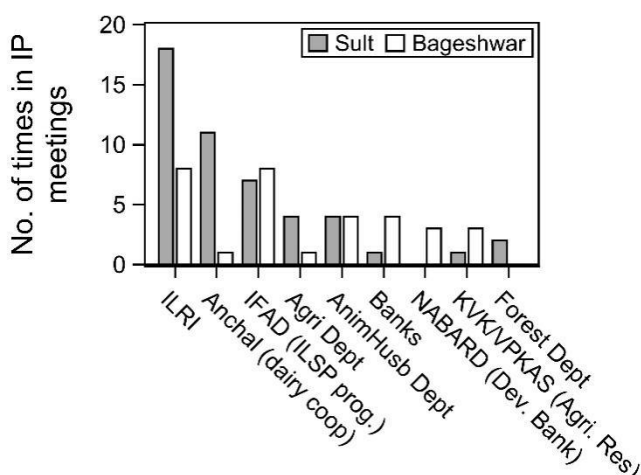


Figure 4-6 Number of times individuals from different organizations participated in IP-meetings

(Dec 2012-Nov 2014)

4.4.2.3 Participation of dairy producers from control and IP mid-clusters

IP-meeting participant records indicate that several producers from control mid-clusters also participated in the IP-meetings (Table 4-4). This was also reflected in the post-intervention household survey which traced participation in IP-meetings.

Table 4-4: Participation of producers from control and IP mid-clusters in IP-meetings

Name of mid-cluster	Type of mid-cluster	No of times/producers participating in IP-meetings			
		Total	Women	Men	% Women
Joshigaon	IP	583	444	139	76
Sainj	IP	507	427	80	84
Barkinda	IP	651	470	181	72
Saknara	IP	747	517	230	69
Nailwalpali	Control	99	56	43	57
Khabra	Control	28	25	3	89
Gehnaheet	Control	47	29	18	62

4.4.3 Chronology of innovations and capacity building promoted by Innovation Platforms

A timeline of when the various innovations were introduced by the innovation platforms in Sult and Bageshwar is shown in Figure 4-7. These innovations fall into two categories, namely technical and institutional/organizational. In addition, the capacity building exercises such as training and exposure visits which arose from the IP discussions are presented.

During the first 6-month period, institutional innovations in the broad area of establishing improved access to milk markets quickly emerged. These included linking farmers to dairy cooperatives in Sult and the formation of the Jeganath Dairy cooperative by a Self-Help Group (SHG) in Bageshwar for sale of excess milk. During this period, capacity building activities included the exposure of farmers to the cooperative approach and the training of project staff on the IP approach, on dairy management, and on technical issues around feed, breed and veterinary management.

Other organizational innovations followed. For example, the national agricultural development bank, NABARD, developed a group-based credit scheme to promote improved dairy cattle breeds. Banks were generally requiring land as collateral for agricultural loans. Thus, women and marginal farmers were not able to borrow money because they lacked land titles. This issue was discussed at a platform meeting. To minimize the risk of payment failure and to strengthen farmer confidence, the banks and NABARD set up a new loan arrangement, following a model used by self-help or producer groups, in which the collective guarantee to repay the loan is accepted as collateral. Thus, any member of the SHG could take a loan of up to INR 100,000 (USD 1,600) to buy two cross-bred dairy cattle as long as the group assumed the responsibility of ensuring that the loan would be appropriately serviced.

Technical innovations such as new feed options were seasonal to the rabi and kharif seasons¹⁴. For example, dual-purpose wheat and barley varieties were introduced in the rabi season, during which period the IPs also evaluated temperate grasses, while fodder crops such as Napier grass, sita grass and millets were tested in the kharif season (Figure 4-7). After market linkages were established through cooperatives and SHGs, investments in key technical innovations were the main focus during the period June to December 2013 (Figure 4-7). For example, it was during this period that farmers began purchasing cross-bred cows. Two issues raised by women in the innovation platform meetings were the difficulties in collecting fodder from the forests and the considerable wastage of fodder due to feeding on the ground. Although the government had provided heavy duty chaff cutters which would have reduced feed waste, these were lying idle since women were physically unable to operate them. Simple, light-weight fodder choppers were sourced from outside the state which were easy for women to operate. Combined with the introduction of feeding troughs, fodder

¹⁴ The Indian cropping calendar is classified into two main growing seasons: kharif (monsoon) and rabi. The kharif season lasts from July to October and the rabi season from October to March

choppers reduced fodder wastage by 11% (T Ravichandran et al. 2016), reducing the labour requirements for collecting feed.

After only a year, considerable amounts of excess milk were being produced in Bageshwar, mainly due to the introduction of high-yielding cross-bred cows. Private milk traders showed their interest in buying the milk, which was procured from the farmers through the Jeganath Dairy cooperative. The cooperative also established a link with a private feed company to source concentrate feed in bulk at a reduced rate, allowing farmers to adequately feed their animals without threatening their returns. Towards the end of the IP treatment intervention period of 24 months, a district level innovation platform was formed, and the scaling of interventions was initiated. The capacity building activities continued for both farmers and the facilitators throughout the IP activities and were generally linked to the technical and institutional innovations currently being introduced.

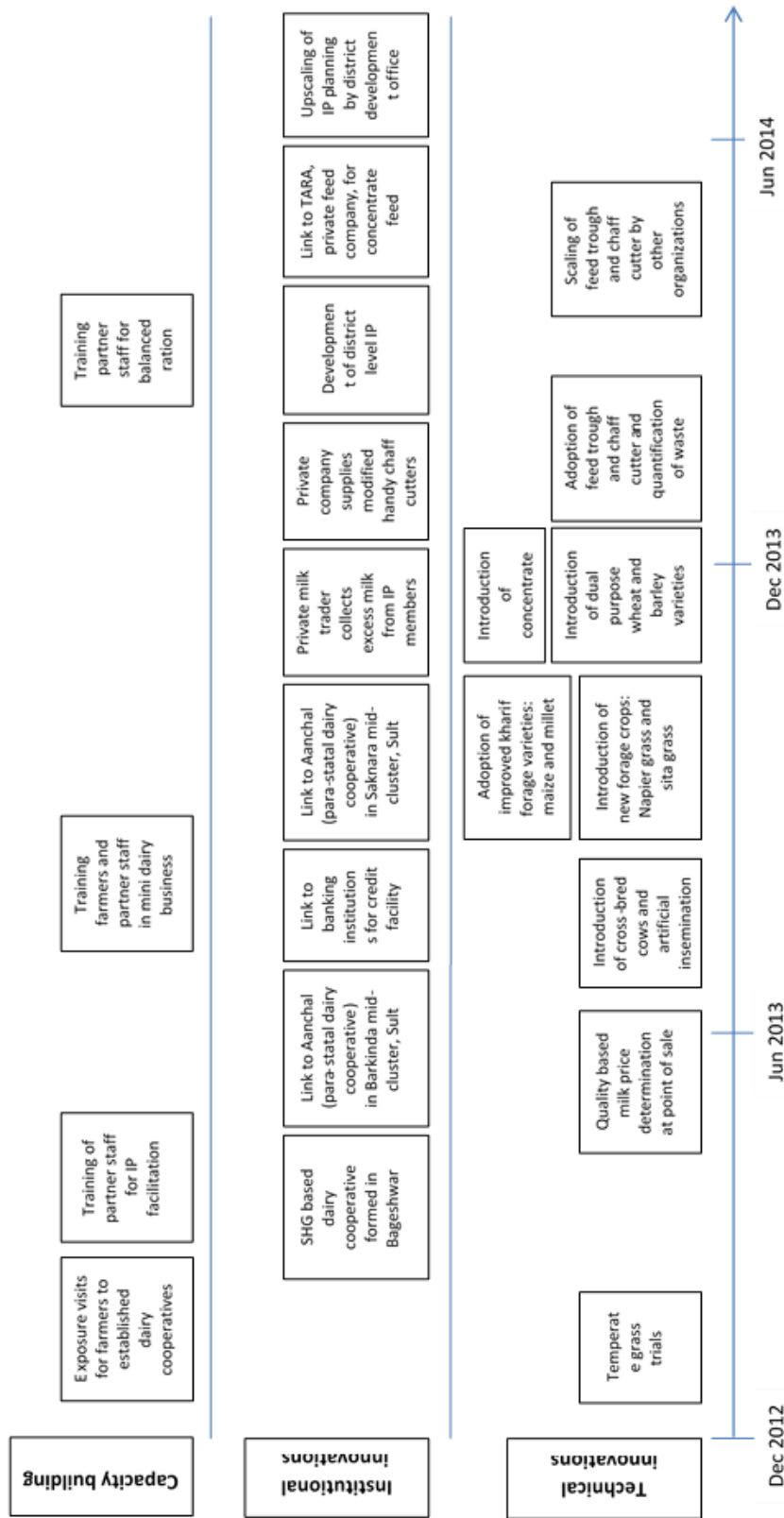


Figure 4-7: Timeline of the innovations and capacity building activities established by the innovation platforms

(Jan 2013- July 2014)

Source: IP-meeting documentation

4.4.4 Impact of introducing IPs

As seen in the above results, we found that the IP process was generally more effective in Bageshwar than in Sult. This was reflected in a range of metrics, including gender inclusiveness, diversity of non-producer actors, prioritization of issues and follow-up of actions. This section presents the impacts of the innovation platforms on the adoption of technological innovations, milk yield and market linkages.

4.4.4.1 Impact of IPs on productivity: Effect of IP treatment and IP-meeting frequency in milk yield

One of our main research questions was whether the attendance of IP-meetings would increase milk yields to improve livelihoods through the technical innovations promoted during these meetings. When model (1) was fitted to the milk yield data the interaction of time (before and after intervention) and treatment (IP or control) was found to be non-significant (DF = 48.7, F = 0.13, p = 0.7165), suggesting that participating in IPs had not increased milk yields in IP-households compared to control households. The only significant effects were the main effect of time (DF = 45.5, F = 49.52, p < 0.0001) and district (DF = 53.7, F = 6.59, p = 0.0131). Average milk yields increased between survey rounds from 1.03 l/day in 2012 to 2.51 l/day in 2014 (data not shown), without this increase being attributable to the IP treatment. Milk yields in Bageshwar were higher on average (2.02 l/day) compared to Sult (1.42 l/day).

However, it should be considered that the IP treatment and control mid-clusters were located close to each other (Figure 4-1). Although the IP-meeting documentation shows a considerably higher participation in IP-meetings from the intervention households (Table 4-4), certain spill-over effects were present. To overcome this spill-over effect, model (2) was used to study the relationship of difference in milk yield with the actual IP-meeting participation frequency, independent from whether households came from treatment or control mid-clusters. The categorical variable which denotes if a household was part of the IP-treatment or control mid-cluster was replaced by the participation frequency which was used as a regressor. Additionally, the initial milk yield from 2012 was included as covariate. Random intercept and slopes were not found not significant in a likelihood ratio test (degrees of freedom = 11, Test statistic = 0.02, p ≈ 1). Hence, further analysis was based on a linear model without random effects. Table 4-5 shows the results of the F-test of model (2).

Table 4-5: Sequential Wald-type-F-tests for fixed effects of model (2) fitted to differences in milk yield

from 2012 to 2014 (Δy_{ilm}) per farm

Effect ¹	Meaning	Numerator DF	Denominator DF	F-value	p-value
d_i	District effect	1	168	2.90	0.0902
β_1	Slope for initial milk yield (imy)	1	169	119.05	< 0.0001
β_2	Slope for IP-participation (IP)	1	169	11.81	0.0007
β_{3i}	District-specific slope for imy	1	165	0.146	0.7085
β_{4i}	District-specific slope for IP	1	166	0.42	0.4211
β_5	Slope for cross-product (IP x imy)	1	167	1.66	0.2001
β_{6i}	District-specific slope for IP x imy	1	164	0.34	0.5595

¹Random effects f_{il} , g_{ilm} , β_{7il} , β_{8il} , β_{9il} , β_{10ilm} , β_{11ilm} , β_{12ilm} were found not significant in a likelihood ratio test and were therefore removed from the model before testing fixed effects.

No district specific slope was significant, nor were the district specific intercepts or the common slope of the cross-product (Table 4-5). However, the common slope for IP-participation frequency was significant (Table 4-5, DF = 169, F = 0.0007). The estimate for the slope was positive (0.1447 with standard error 0.04212), indicating a significant increase of milk yields with increasing participation in IP-meetings (Figure 4-8a).

Furthermore, the slope of initial milk yield was significant (Table 4-5, DF = 169, F = 119.05, p < 0.0001). The estimate for the slope was negative (-1.0562 with standard error 0.09680), indicating a negative relationship of milk yield and initial milk yield (Figure 4-8b). Hence, households with lower initial milk yield in 2012 showed the largest increases in milk yield in 2014. On the other hand, households with already high milk yield in 2012 had relatively similar yields in 2014. Moreover, 23% of farms showed a negative Δy_{ilm} indicating a reduction in milk yield from 2012 to 2014, which most involved farms with the highest milk yields in 2012.

A final remark on the regression in model (2): a regression with two regressors results in a three dimensional ‘response surface’. In this case it has the shape of a flat plane, as no cross-product terms were significant. Figure 4-8 presents two transects through the response surface. Figure 4-8 a) is a transect parallel to the axis of IP-participation and Figure 4-8b) is a transect parallel to the axis of initial milk yield. Participation frequencies in Figure 4-8a) show a strong right skewed distribution with few very high participation frequencies and many low frequencies. Extreme values in a regressor can have a strong influence on the

estimation of the slope. The so called ‘leverage’ is a measure of the influence each single observation has on the estimation of the slope. In model (2) a strong positive relationship of IP-participation and leverage was found, raising the suspicion that the positive relationship of increase in milk yield and IP-participation is caused by few very influential observations. For verification, parameters of model (2) were re-estimated from a dataset where all observations with a leverage larger than twice the average leverage were excluded (Richter and Piepho 2017). The common slopes for IP-participation and initial milk yield remained significant, but in addition also the slope on the cross-product turned significant (data not shown). Hence, results appear to be relatively consistent, despite the skewness of the IP-participation.

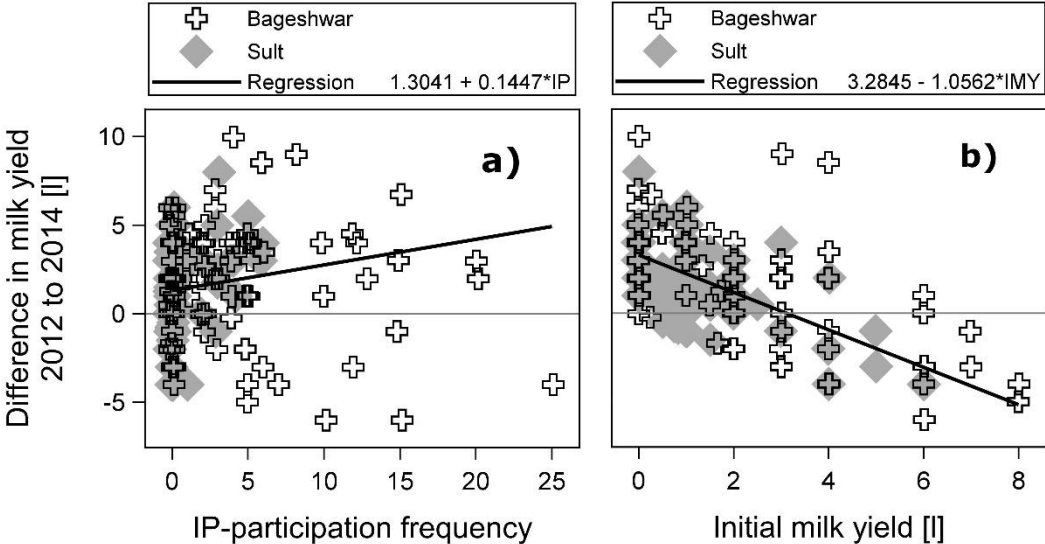


Figure 4-8 Regression analysis for association of differences in milk yield between
 Time period: 2012 and 2014: a) IP-meeting participation and b) initial milk yield in 2012

4.4.4.2 Adoption of technology innovations

The baseline FGD FEAST study and the baseline household survey indicated that the IP mid-cluster households were already more advanced than the control mid-cluster households in terms of technology adoption, including the use of feed troughs, ownership of cross-bred cows and uptake of government benefits (Table 4-6).

Two descriptive comparisons were made post-intervention: the comparison between control and IP mid-cluster households after intervention and the comparison of intervention households before and after interventions. The post-intervention household survey explored

the effects of IP interventions on adoption of feed and breed technologies. Households from IP mid-clusters showed greater use of improved practices than control mid-clusters in post intervention which includes feed trough use, artificial insemination, cross-bred animals, concentrate feeding and market linkage improvement (Table 4-6).

When we compare the households from the IP group before and after the interventions, there is an improvement in all technological and institutional indicators (Table 4-6). However, there is also marked improvement in control group households also before and after interventions in artificial insemination, concentrate feeding and crossbred cows.

4.4.4.3 Increased market and institutional linkages

We found considerable differences in the extent of institutional linkages between control and IP mid-cluster households. Households from IP mid-clusters were found to have changed their marketing arrangements and to have taken up membership of either government-based cooperatives or SHG based dairy cooperative groups far more than control households (Table 4-6). The impact of these institutional changes is reflected in changes in the volume of milk sales, the share of milk sold and dairy incomes. IP mid-cluster households sold more milk and had higher dairy incomes than control households after interventions (Table 4-6).

In addition, changes in the control households were also observed, especially in cooperative membership, sale of milk and savings from milk sale. There is slight increase in cooperative membership in control households, but this has not led to considerable changes in market channels. The savings from milk sales increased threefold compared to the pre-intervention period. This is in line with the previous findings on increased milk yield from control households due to participation in IP meetings.

Table 4-6 Adoption of technologies, institutional innovations and market linkage between control and intervention clusters before and after interventions

Variable	Survey			
	Baseline (Focus group discussion)		Post-intervention household survey	
	Control	IP	Control	IP
n (size of sample group/hh)	12 (142)	12 (167) ^a	96	96
Adoption of technologies				
Feed trough use (%)	3	12	5	55
Chopping fodder (%)	0	1	12	20
Concentrate feeding (%)	60	70	75	95
Artificial insemination (%)	10	15	19	38
Owning Crossbred cow (%)	1	5	5	21
Days fed improved fodder	5	10	6	52
Institutional innovations				
Cooperative membership (%)	2	10	8	51
Change dairy market channel (%)	0	2	1	14
Access to public dairy schemes (%)	1	5	1	40
Milk transactions				
Total milk sold/day mean (L/hh)	0.1	0.2	0.5	1.0
Share of milk sale (%)	5	10	13	19
Savings from milk sale mean (INR/year)	800	1200	2466	4311

^a There were 12 FGD in each control and IP area, values in parenthesis are total number of farmers participating in FGD

4.5 Discussion

The objective of the study was two-fold: Firstly, to determine the impacts of the IPs on productivity, technology adoption and institutional changes and secondly, to identify the IP processes that supported these impacts. This study showed that implementation of IPs led to rapid change in the institutional arrangements around market linkages. Subsequently, farmers showed strong interest in the new market arrangements and price decisions. This was also possible due to collective action because of homogeneousness and purpose of the group (Olson 1971). When the IP is working towards the market linkages there are faster results when all parties experience benefits (Tenywa et al. 2011). This finding supports previous arguments that IPs should focus on institutional innovations along with technological innovations (Schut et al. 2018). The market acted as a motivation for farmers to spend in feed innovations and to purchase high yielding dairy animals because they had the confidence to be able to sell their milk at competitive prices. Initial participation of farmers in IPs may be motivated by their need for knowledge, skills and by curiosity. Long-term participation requires economic and material incentives (Mulema 2012). This study indicates that indirect

benefits of participation such as economic benefits and livelihood enhancement, encourages other farmers to also participate in IP dialogues.

The outcomes in the Bageshwar IP were more evident than in Sult, especially regarding increases in milk yield, milk sales and follow-up of issues. In Bageshwar more crossbred cows were introduced due to IP interventions leading to higher milk yields. An important underlying factor was the more diverse range of stakeholders participating in Bageshwar than in Sult which led to a stronger institutional model. It may be argued that this was supported by easier market access compared to Sult. Discussions of issues in IP-meetings were very wide-ranging and continuous throughout the project. Previous studies have also found that co-evolution of innovations happens more readily when platforms are highly dynamic and distributed in composition rather than being static and drawing from a narrow stakeholder base (Boogaard et al. 2013; Kilelu, Klerkx, and Leeuwis 2013b; Nederlof and Mariana 2011). Stakeholder groups are more likely to be involved and support the solutions when they are part of the decision making process (Neef and Neubert 2011) which is evident in this study through the financial institutions which were fast to act in the IP. Another important factor for better outcomes in Bageshwar was the presence of SHGs in Bageshwar which also supported non-participating household producers through the diffusion of information and technologies. A similar finding can be seen in a previous study (Pamuk, Bulte, and Adekunle 2014b) where the adoption of crop management practices was different in different IPs depending on the previous social capital in that area. Social capital helps to build knowledge diffusion (Semeon et al. 2013).

Our results indicate that increases in milk yield and technology and institutional change occurred not only in selected mid-cluster households but also in households from control mid-clusters. This was also related to their participation in IP-meetings, which shows that participation in IPs enhanced their network with participating stakeholders. This in turn helped them to adopt crossbred cows supported by financial institutions. They also benefited from the new institutional arrangements for the sale of milk. As the control mid-clusters were in close proximity to the IP mid-clusters, peer to peer diffusion of innovations was key for scaling (Hendrickx et al. 2015). A positive finding was that innovative processes and benefits attract producers from nearby communities, and this has important implications for using IPs to bring about change at scale. From a methodological point of view, we found that selection of communities that are proximate to each other diluted the treatment effect when analysing

impacts due to spill-over effects. Future studies aimed at quantifying the impact of IPs should take account of the need for geographical separation of control and treatment communities.

On the issue of scaling, our work suggests that simple technical innovations such as feed troughs, choppers, improved fodder and crossbred cows can be directly scaled up by the participating stakeholders. On the other hand, scaling the organizational innovations is more dependent on effective innovation platforms as these innovations are more complex in nature (Duncan et al. 2015; Hendrickx et al. 2015) and require consensus among many stakeholders which in turn is based on dialogue and negotiation.

Women are often excluded or poorly represented in value chain projects especially in producer organizations (Kaaria et al. 2016). Because the participation of women in this project was so strong, production constraints including fodder wastage and lack of access to milk markets, were specifically addressed, which would not have been possible if the IPs had been dominated by men. It is important to note that understanding the issues of women and men beforehand is important so that IPs can help to derive relevant solutions (Mulema et al. 2015; T Ravichandran et al. 2016).

4.6 Conclusion

The innovation platform approach was chosen to deal with the complex issue of market imperfection and low productivity among small holder dairy farmers in Uttarakhand, India. This study aimed to determine how IPs contribute to impacts at various levels. The main contribution of this paper is to provide robust evidence that IPs not only help with technology innovation but also facilitate improved institutional arrangements to allow market innovation. Improved marketing arrangements were quickly achieved because farmers and other stakeholders had clear incentives to initiate these changes. These institutional changes attracted new farmers into the IP approach even though they were not initially members of the innovation platforms. Strong participation of women in the IPs ensured that gender-related constraints were identified and development actors initiated actions to address these issues which would not have been possible otherwise. This study concludes that the specific innovations or interventions emerging from IPs are determined by local site characteristics, diversity of IP participants, quality of discussions and continuity in following up on the agreed action plans. Although the study had limitations including the short time-scale of investigation and the effects of spill-overs caused by the proximity of target communities, the data provide rare quantitative evidence for IP effectiveness at household and community level

associated with both productivity and market improvements and provide a base upon which to build future work on IP effectiveness.

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5 Discussion of main findings and policy implications

Good policies and sound institutional arrangements are important stepping stones to achieve inclusive growth, where all sections of communities get benefits (Alvaredo et al. 2018). However, there are many issues such as poor governance and gender inequality linked with these institutional arrangements especially in developing countries. Dairy production in developing countries has huge potential to reduce poverty as there is high demand for dairy products. It is mainly because dairy animals are dominantly owned by smallholders. However, the role of dairy production in addressing the aforementioned issues depends on local circumstances, for example, in some countries there is high growth but it is not inclusive. Therefore, this thesis aimed at contributing to a better understanding on how to unlock the potential of dairy development to support inclusive growth and poverty reduction. Based on the comparative analysis conducted in chapters 2 to 4, and using a conceptual framework (Figure 1-2) for guidance, the general discussion is focused on the following key areas : (1) What are the institutional arrangements which influence inclusive market integration and productivity enhancement? (2) What are the governance structures and processes which facilitate the representation of women and the marginalized in institutional arrangements for dairy market development? (3) What is the role of an innovation platform approach in achieving inclusive market growth and productivity enhancement? In the second part of this chapter limitations of the research work and policy implications are discussed.

5.1 Which institutional arrangements influence inclusive outcomes?

From chapter 2 and 3, a summary of the main findings for inclusive outcome of market integration and productivity enhancements through different institutional arrangements in Bihar and Telangana are outlined in Table 5-1 and Table 5-2. In Telangana, women only dairy cooperative arrangements were more inclusive for women and marginalized for market integration and productivity enhancement than mixed dairy cooperatives. In the Telangana mixed dairy cooperative, women and low caste people were not given a chance for membership, leadership roles or training opportunities. Women from mixed dairy cooperatives did not have access to dairy income nor control of it (Table 5-1). On the other hand, women only dairy cooperatives in Bihar were inclusive for women and low caste only in membership, access to income, and training aspects (Table 5-2). Leadership roles and access to inputs and services were accessed by men due to shadow managerial roles of

women. Whereas mixed dairy cooperatives in Bihar were not fully inclusive for women. However, compared to the mixed dairy cooperative of Telangana, women and low castes benefited from market integration, productivity enhancement, input and training support. Exclusion of women and the marginalized is more evident in Private dairy companies in Telangana for membership and access to services. Moreover, private dairy companies are more concentrated on processing milk rather than productivity enhancement services. Informal markets in Bihar were more inclusive for market integration but lack support for productivity increase.

5.2 Gender inclusive institutional arrangements

It is important to consider the impact of women's participation in economic organizations such as cooperatives. Because participation of women in market institutional arrangements not only brings economic benefits but also builds other aspects such as an increase in self-confidence, better negotiation skills, improved gender relations within households and taking part in household decisions (Burchi and Vicari 2014; Ferguson and Kepe 2011; Majurin 2012). These benefits are often ignored by the economic studies.

In this study, gender bias is very evident in all market institutional arrangements except women only dairy cooperatives in Telangana. These findings are in line with previous studies about village panchayat raj systems and dairy cooperatives where gender bias was reported for leadership roles (Birner 2010; Gupta 2000). Under-representation of women in agricultural cooperative membership and leadership is evident in other countries also such as East Africa, where land is a key issue for membership in agricultural cooperatives (Majurin 2012).

What institutional arrangements facilitate the representation of women? Women's participation in dairy cooperatives was encouraged through reservation quotas where only women are members in dairy cooperatives. But there are different outcomes for gender inclusion in Telangana and Bihar. In Telangana, the women's dairy cooperative is more gender inclusive in all aspects from village to union level than the Bihar women dairy cooperative. Key differences are the implementation of policies which are top down and controlled by the state in Bihar, whereas in Telangana implementation of the women only cooperative is self-driven and there is no interference by the state in its implementation. One important finding of this study reveals that reservation quotas for women in dairy memberships will not always guarantee benefits for women especially in the case of

leadership roles and access to control of dairy income. However, the study has reported that access to membership will facilitate participation in trainings, decision making meetings and leadership roles.

Another important outcome of participation in market institutional arrangement is productivity enhancement. Access to inputs and services through formal organizations such as cooperatives is important for productivity enhancement for women and marginalized farmers. This finding is also in line with previous literature that collective action arrangements sometimes exclude the poorest and marginalized (Bernard and Spielman 2009; Quisumbing and Pandolfelli 2010). Recent research on the impact of dairy cooperatives in Andhra Pradesh also supported that small and marginal farmers were not benefited from dairy cooperatives for breed improvement and high income growth (Squicciarini et al. 2017). Apart from cooperatives, other institutional arrangements such as private dairy company and informal markets are not supported for inputs and services. They deal only with the marketing of milk. This study concludes that private investment for processing milk will not guarantee productivity enhancement. However, this conclusion should not be generalized because the private institutional model in this study covers only a small area and is also context specific.

There is evidence that innovation platforms in Sult and Bageshwar were inclusive socially and for both genders as there were more women participants than men in IP meetings and most of the farmers were marginalized. Most of the constraints addressed in IP meetings were women based issues. This approach is beneficial specifically to deal with complex issues for dairy development such as high transaction cost, low productivity, unorganized market, unorganized stakeholders etc. The aim of the IP approach was to increase productivity and market integration, however the approach also achieved inclusive outcomes. IPs have revealed that productivity enhancement such as increased milk yield was observed in the households who have participated in IP meetings. Institutional innovations for market development were attractive to producers from control mid-clusters too which resulted in increased productivity and also adoption of technological innovations.

Table 5-1 Outcome of market institutional arrangements in Telangana for market integration and productivity enhancement

Outcome indicators	Women only dairy cooperative	Mixed dairy cooperative	Private dairy company
Market integration			
Membership	Gender inclusive, 100 % of members were women. Inclusive to marginalized	Gender bias, 100 % of members were men. Inclusive to marginalized	Gender bias, 100 % of members were men, not inclusive to marginalized/poor
Leadership roles	Gender inclusive from village to union level. Inclusive to marginalized	Not inclusive for women and lower caste. Mostly are men from higher caste	Only men from high caste are in leadership roles
Active involvement (meeting, voting, decision making)	Gender inclusive, 87 % of women involved, no bias in class and caste for voting and meeting	Gender bias, no women are involved, and lower caste excluded from decision making	Members are not involved in any decision making
Access to & control of dairy income	Gender inclusive, 87% of women have access to and control of income from dairy cooperative	Only 6% of women have access to dairy income	Most income is controlled by men
Productivity enhancement			
Input and service support (credit, health, feed and breeding services)	Gender inclusive as most of these services are accessed by women, mild bias for poorest and lower caste to access to inputs	Gender bias, all the inputs and services are only for men. Bias towards poorest/lower caste for subsidy of inputs	Credit services and feed support is given to land resource farmers and men
Capacity building/ training for productivity increase	55% of women attended training programme. No bias towards marginalized	No women attended any training. Lower caste households never attended training	No training, only exposure to dairy company for rich male farmers

Table 5-2 Outcome of market institutional arrangements in Bihar for market integration and productivity enhancement

Outcome indicators	Women only dairy cooperative	Mixed dairy cooperative	Informal market
Market integration			
Membership	Gender inclusive, 100% of members were women. Inclusive to marginalized	Gender bias, only 21% of members were women. Inclusive to marginalized	No membership but inclusive to women and marginalized
Leadership roles	Shadow managers of women in village level. Low caste people are not given chance, forced selection	Not inclusive for women and lower caste. Mostly men from higher caste	No leadership roles
Active involvement (meeting, voting, decision making)	Only 24% of women involved, members from low castes not allowed to cast vote	44 % of women involved in meeting and decision making, members from low caste are allowed	Members are free to decide
Access to & control of dairy income	49% of women have access to and control of income from dairy cooperative	Only 27% of women have access to dairy income	Most income is controlled by women

Outcome indicators	Women only dairy cooperative	Mixed dairy cooperative	Informal market
Productivity enhancement			
Input and service support (credit, health, feed and breeding services)	Not gender inclusive as most of these services are accessed by men due to shadow management of women in leadership, bias for lower caste to access subsidy	Most of the inputs and services are accessed by men. Bias towards lower caste to access subsidy (credit, feed)	No input support available
Capacity building/training for productivity increase	57% of women attended training programme mostly from high caste, few women from lower caste attended	27% women attended training. Lower caste also attended training but very few	No training

5.3 Factors which influence the inclusive outcome for dairy development

In the above section we have seen that there is variation in different institutional arrangements for inclusive dairy development. In this section we discuss what are the factors which influence these outcomes for inclusive dairy development. The factors are divided into two groups: 1) institutional structures; 2) governance processes.

5.3.1 What institutional structures influence the outcome?

Decentralized institutional structure and decision making: It is interesting to note that the governance structures within cooperative set ups in the women only dairy cooperative in Telangana and market innovations in the innovation platform approach in Uttarakhand were autonomous in function. However, they received support from the state for the infrastructure, processing and input. The producers in autonomous cooperatives have freedom to participate fully in membership and leadership roles which were not followed in state controlled cooperatives such as the Bihar dairy cooperatives. The state and cooperatives have conflicting goals: the state prescribes centrally determined activities to be carried out by cooperatives, but these may give different results in different locations depending on local contexts. This will lead to low levels of member participation and discourage non-members to join. There is more political interference in decision making and selection of local leaders to run the cooperatives. State interference in cooperatives slows down the growth and decreases member enthusiasm to participate in decision making (Das et al. 2006). This is the main reason for the failure of dairy cooperatives in some states. State support is essential for cooperatives only for the infrastructure and supportive policies. Based on this, it is concluded that state support is needed for dairy cooperatives for infrastructure and policies but state interference in decision making within cooperative governance structure will impede inclusive growth.

Gender inclusive governance structure: another important factor which played a key role in the success of the women only dairy cooperative in Telangana is gender integration in the governance structures from village level to management, including monitoring staff. As women are carrying out labour work for dairy production at the household level, their participation in decision making as members and leaders is important. It will lead towards women's empowerment in the long run. Communication between women in the hierarchy of cooperatives is easy if there are women at all levels. Gender inclusive governance structures will facilitate gender friendly training and capacity building activities which was evident in the women only dairy cooperative in Telangana. Therefore, it is important to address all the gender issues which hinder dairy development. This is evident in the innovation platform case study where market and technology issues relevant to women were raised by women. We can provide evidence from earlier literature for the importance of reducing the gender gap and its role in productivity enhancement. Reducing the gender gap would increase yields by 20-30% which could reduce global hunger by 12-17% (FAO 2011; World Bank 2017). This study concludes that gender integration should adopt a bottom up approach with a strong focus on human and social capital development rather than reservation policies for membership in cooperatives.

Institutional outcome is specific to local context: There are three types of institutional arrangements according to geographical context in this study: one type is covering a small area of 25-30 kilometers in Telangana, the other one is in Bihar where the dairy cooperatives operational area is about 500 km and third one is the innovation platform in Uttarakhand where a small geographical area of 20 km covers only a few villages. The women's dairy cooperative in Telangana performed better than the women's dairy cooperative in Bihar. The concept of efficiency in cooperatives depends upon the degree of member's participation in the cooperative's operations (Lamming 1980). When the cooperatives are bigger it is difficult to maintain the high efficiency of cooperative management. Furthermore, institutional success in any area depends on local socio-economic factors. In Bihar gender inequality within households is high and strict social norms are followed more than in Telangana which prevents women from participating and obtaining benefits even though cooperative membership is reserved for women. From the Innovation platform, it is evident that stakeholders can contribute to institutional development and technology adoption if the target communities are location specific and limited in numbers. This concludes that inclusive

outcomes can be the result if there is a decentralized institutional arrangement that is adjusted according to different socio-economic conditions and limited area of operations.

5.3.2 What are the governance processes which influence the outcome?

Good leadership: leadership and governance are crucial for common outcomes of institutional arrangement (Duerst-Lahti and Kelly 1995). Common outcomes also determine individual's benefit so in turn leadership and governance also influence individual's outcomes. It is important to mention in this study that the impact of formal market institutional arrangements on dairy income and productivity enhancement depends upon the good leadership and shared governance within village or union, or federation level. Main leadership roles which determine the governance of dairy cooperatives in this study are secretary and chairperson at village level and managing director and chairperson at union or federation level. This is evident in this study where secretary played key roles in the mixed dairy cooperative in Bihar. The chairperson and managing director of the women's dairy cooperative in Telangana was also important. It is interesting to note that there is gender bias in leadership roles in all institutional arrangements except the women dairy cooperative in Telangana. Women often face constraints of being recognized and accepted as legitimate leaders (Eagly and Karau 2002). Power relations within a community automatically facilitate resource rich men for leadership roles (Duerst-Lahti and Kelly 1995) and leadership roles may also be a by product of exploitative social domination (Hooper, Kaplan, and Boone 2010). Another important qualitative aspect of leadership for inclusive outcome is education or knowledge about leadership roles which facilitate better decision making process. This is the reason for the shadow management in the Bihar women's dairy cooperative where their husbands act as leaders. The same was observed with village panchayat leaders as well (Birner 2010). An important leadership aspect to note in the innovation platform based market institutional arrangements in Bageshwar is shared leadership by different members, which resulted in a better follow up of planned actions.

Local democratic practices: The Telangana women's dairy cooperative has shown the democratic principles through electoral selection of leaders and participation of members in decision making meetings. These are defined by literature as representative and participatory democracy (Kaswan 2014). Representative democracy explicit the representation of members which is considered as nominal if there is lack of active participation, but participatory governance is the active involvement of members in governance level. Active involvement of

members gives the rights for monitoring the performance of leaders. Monitoring rights of members is highly related to the social performance of cooperatives (Kyazze, Nkote, and Wakaisuka-Isingoma 2017). From Chapter 2 and 3 we can see that the Telangana women cooperative followed periodic elections and regular meetings, so members had a chance to raise their issues. This is not followed in other cooperative models in Bihar and Telangana where leaders were not elected by voting for three decades past and there is no monitoring system to follow these democratic practices due to state control. It is important to see the institutional arrangements and assess whether they follow democratic community development which is theorized by William Thompson to achieve equality (Kaswan 2014). This governance of democratic principles is followed differently in the cooperatives depending on their size and location. Local institutions are more representative, more accountable and more proximate to the people than the remote national institutions and those which is evident in this study. The innovation platform meeting in Sult and Bageshwar (Chapter 4) also provided evidence that the democratic participation of members facilitated the members to raise their issues and benefitted with higher productivity and market linkage. This study concludes that cooperative outcome for inclusive growth can be achieved if democratic principles are followed at all levels including village level to management level of institutional arrangements so all members of society can participate equally for decision making.

Gender inclusive practices: Active participation of women is important for inclusive dairy development. Several authors have documented that women's participation in user groups improves the governance structures (Agarwal 2001; Coleman and Mwangi 2013). This study has provided interesting evidence that women in nominal memberships alone does not bring benefit in the area of control over dairy income. Active levels of participation for women is needed in training, decision making and voting. There are several factors which influence women's participation. Active participation of women is observed when gender friendly practices are followed in the institutional arrangements. This study provided evidence that the women only dairy cooperative in Telangana and innovation platform meetings followed gender friendly practices such as meetings in village level so women can attend, flexible timings for meeting and training etc. Women reported that capacity building through training and participation in periodic meetings increased their confidence and bargaining power within the household and changed gender relations in a positive way. Women also participate in decision making (breeding, nutrition and animal health) which were previously dominated by

men. It is interesting to note that the leadership quality of women in the women only dairy cooperative in Telangana is visible, women were trained at all levels from village to management levels which is not observed in the Bihar women dairy cooperative. This concludes that training and capacity building is important for women to achieve good governance.

Socio economic conditions of farmers are well known to influence outcomes, especially market participation and productivity (Kaaria et al. 2016). This study provided evidence that education or knowledge of women influence her confidence in household decision making and positively correlated with dairy cooperative membership and control over dairy income. This part adds evidence to earlier literature that training and capacity building enhance knowledge and builds women's empowerment (Kabeer 2001; Meier zu Selhausen 2015)

This study provided an interesting opinion of women on land ownership related to market participation of women. Women perceived that land is common within household level even though the ownership title is held by men. Women concluded that the availability of land is important for dairy productivity but an not important criteria for dairy market participation. Even landless women also participate in the dairy market due to access to common resources. However it is important for women to be aware of their rights for land and asset ownership which indirectly influences decision making, mobility and bargaining within the household level (Dekker 2013; Klugman et al. 2014; Pena, Maiques, and Castillo 2008).

This study provided evidence that women who are already members of self-help groups also participate in dairy cooperative membership and have better access to dairy income. Preliminary social capital through self-help groups would enhance the member's cohesiveness and solidarity (Das 2011; Westermann, Ashby, and Pretty 2005), which led towards improved governance. It was also evident in the women's dairy cooperative in Telangana, the mixed dairy cooperative in Bihar and the self-help groups representation in the innovation platforms in the Uttarakhand projects. This study concludes that improving education, knowledge and social capital of women will help in the long run for increasing confidence to participate in economic organizations.

Policies and frame conditions: Cooperatives need a supportive policy framework to be sustainable in developing countries to create a large and vibrant cooperative sector (Mwanja et al. 2014). Supporting institutions and policies are important for the success of institutional

arrangements. Monopolistic institutional arrangements will lead to poor governance which is evident in Bihar where only government-based cooperatives are operative. Producers are only depending on this institutional arrangement to sell their milk which reduces their voice and decision making. On the other hand, multiple innovative policies are in place in Telangana which facilitate competitive governance and decentralized institutional arrangements such as mutually aided cooperatives and producer companies where there is the least state control. These competitive institutional arrangements improve the governance process and give the maximum price for milk, provide input support and services which enhances the productivity.

5.4 Does participation of women in formal market institutions bring positive benefits?

This study provided examples of positive changes in gender relations due to women's participation in dairy cooperatives in membership and leadership roles. Control over dairy income is the most important aspect relevant for the economic empowerment of women. Economic empowerment can influence changes in decision making within households which is evident in this study. This will contest the social norm of restriction of women's mobility to public spaces.

Some findings did emerge from this study on whether women's membership and leadership roles have led to gender-responsive plans which include policies and infrastructure to solve their issues. This is evident in the innovation platform approach where action plans were based on issues faced by women in that region. A review of the literature led to the conclusion that gender responsive plans and policies are dependent on institutional structures and political opportunities to enable women's voices to be influential (Domingo et al. 2013). This study provided evidence on expenditure patterns from dairy income that showed that women spend more for household food security, child education, savings and on household member's health than men. This supports the hypothesis that investment for women's economic and social empowerment will benefit household and family welfare in the long run. However, previous literature in Nigeria reported that changes in economic relations through women having access to microfinance led to domestic violence within household level (Wrigley-Asante 2012). In contrast, in the Telangana women's dairy cooperative, men have changed their opinion about women's control over dairy income due to the positive impact within households even though the understanding has taken some years to accrue.

5.5 Study limitations and future area of research

The study objective was to find out and compare the institutional arrangements for inclusive dairy market growth, so the study took samples of only those producers who sell milk to any one type of institutional arrangements. The study has not included men and women who didn't participate in the dairy market for selling their milk, or farmers without any animals or milk to sell. The inclusion of this category of farmers could have provided an explanation as to why they do not possess dairy animals and what measures needed to be taken.

The study has taken most of the existing market institutional models in the selected sampling area in a state or district. However, some institutional models were not present, for example the informal dairy market in Telangana and private dairy companies and producer companies in Bihar. Expansion of the sampling area to include all institutional models was not done due to budget and resource constraints. However, the institutional arrangements selected in Telangana and Bihar represented the existing institutional structures in those states.

The generalization of the impact of institutional arrangements should be done carefully by considering local socio-economic conditions. However, the findings of governance issues and gender constraints are similar for all the institutional arrangements in both Telangana and Bihar. Even though the study explored the opinions and reasons for the issues in institutional arrangements in the dairy market through qualitative methods, these findings are based on individual experiences and opinions.

The quantitative assessment of households and individuals for income and productivity impact in Telangana and Bihar could have complimented the findings more strongly. The innovation platform impact assessment study is partly fulfilling this limitation even though there is a lack of detailed data before and after interventions for generalization. However, a post intervention survey supported the generalization.

5.6 Policy implications and recommendations

The findings emerging from this study can be structured around key areas to ensure gender equality and social inclusion in institutional arrangements for inclusive dairy market growth.

1. *Social and gender inclusion analysis*: Social and gender analysis is important while promoting any institutional arrangements for agricultural market establishment. This helps to get insights on gender roles and responsibilities and who owns which

production system, thus helps to make strategies for inclusion of all communities including women and poor.

2. *Ensure that institutional arrangements for the market are context specific:* Innovative institutional approaches that are not grounded in a particular local context and for particular group of people (men and women) will be ineffective. Understanding the local context is very important when designing any new institutional arrangement. Ex ante assessment of impacts will be helpful to assess whether the particular arrangement supports inclusive growth.
3. *Gender inclusive institutional structures at all levels:* It is recommended to promote the active involvement of women from village to federation or union level.
4. *Promote representation of women in leadership roles:* The focus should be on capacity building and training to enhance their knowledge through a bottom up approach. This will support active involvement of women in dairy cooperatives and also control over dairy income.
5. *Promote a multi-dimensional approach for women's empowerment:* Improve participation of women in decision making and leadership roles. Complimentary activities are needed, like promoting social capital through self-help groups, capacity development, contesting social norms and promoting legal gains.
6. *Promotion of women for equal access to control over dairy income:* It can be achieved through direct transfers into their accounts.
7. *Enhance active involvement of women in training and decision making meetings:* It can be done through target based training at flexible venues, use of digital media and flexible timings to ensure participation in meetings. Meeting documentation and compliance records for monitoring inclusive and meaningful participation are recommended.
8. *Restrict state involvement:* The state involvement should be limited to infrastructure development, input support, monitoring progress and supportive policies.
9. *State should provide support to informal dairy markets:* It can be carried out through the provision of input support and maintenance of quality standards.

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Declaration

I hereby declare that I have independently completed this dissertation and it is original. No aid is used other than the sources and resources that are properly documented. I confirm that all quotations and statements that have been inferred literally or in a general manner from published or unpublished writings are marked as such. This work has been used neither partially nor fully for achieving any other academic degree.

A handwritten signature in black ink that reads "J.R. Thanammal". The signature is written in a cursive style. Below the signature, there is a small, faint watermark or logo that appears to be a circular emblem with some text inside, but it is not clearly legible.

Stuttgart-Hohenheim, March 2020

Thanammal Ravichandran