

## Evolving localized innovation system: The case of Imasree Farmer Producer Company

Sreeram Vishnu & Jancy Gupta

Division of Dairy Extension, ICAR-NDRI, Karnal, Haryana, India

Email: [jancygupta@gmail.com](mailto:jancygupta@gmail.com)

**Abstract:** A growing body of literature articulates the need for an innovation system approach in the management of value chains to benefit smallholder producers, arguably the weakest link. This paper gives insight on the development of a grassroot-level dairy value chain, dominated by small holder women producers. A range of organizations with a stake in the dairy sector, who worked in tandem with the farmers of the locality are credited for its emergence. The Agricultural Innovation System framework was used in the present study to understand the dynamics of innovation capacity and the linkages. Snowball sampling method, supplemented with key informant interviews were used to collect data for the study. Mapping of the diverse innovation system actors was done using the Social Network Analysis. The findings suggest that institutional pluralism, convergence and sustained actions were vital to the evolution and sustenance of a localized innovation system and its governance.

**Keywords:** Institutionalisation, social network analysis, learning, networking, convergence

### Introduction

Indian agriculture is increasingly being characterized by variety of new actors, policies and relationships that influence how small-scale, resource-poor farmers access and use information. The dynamic interplay of a multitude of actors is also recognized in the dairy sector, an inseparable component of agriculture. While these growing complexities suggest opportunities for farmers (Spielman et al. 2010), little is known about how it can be effectively leveraged to promote innovation, the process by which social actors create value form knowledge (Danne 2010). As the literature suggests, the innovation system framework discussed in World Bank (2006) could address this dilemma, as it identifies innovation as a product of interaction among multiple stakeholders who stitch together knowledge from a variety of sources as well as effecting necessary linkages (Kilelu, Klerkx & Leeuwis 2013). Moreover, the innovation system perspective offers the opportunity to embrace not only the knowledge suppliers but the totality of and interactions of actors involved in innovation (Spielman, Ekboir & Davis 2009). This system is embedded in an institutional context which determines how individual actors behave and interact with other elements of the system. Apparently, interactions among these diverse stakeholders pave the way for innovation by drawing upon the most appropriate knowledge. Innovation thrives in a proper enabling environment such as in a value chain context (Rajalahti, Janssen & Pehu 2008). The network of interactions and relationships of the multiple stakeholders can be linked to a value chain both vertically (buyer-seller relationships) and horizontally (inter-firm coordination, linkages to services providers and to policy makers) in the dairy sector (Msaddaket al. 2017). Hence this study attempts to blend the innovation system framework with value chain approach and to analyse the actors and their relationships. Imasree, an evolving dairy value chain governed by small holder women dairy producers of Idukki, Kerala was identified for this purpose.

This paper tries to portray the evolution of a localized innovation system with the engagement of variety of actors from various domains and the stages of its institutionalization. The roles played by various actors in this backdrop and the alliances forged among them are discussed in detail to have a thorough understanding on the full innovation history.

### Background

The Imasree Farmer Producer Company (IFPC) was built over the past seven years. Incremental changes in its form were the result of continuous learning, networking and experimentations in search of institutionalisation for enhanced sustainability. A range of organisations including line departments of agriculture and allied sectors, veterinary university and some other relevant livestock development organizations, who worked in tandem with the dairy farmers of the locality, are credited for its emergence. The institutional metamorphosis unfolded from the stage of Joint Liability Groups (JLGs) under the *Ksheerasagaram Samagra* Project of Kudumbashree to Commodity Interest Groups (CIGs) under the Agricultural Technology Management Agency (ATMA) and to its present form. A serious setback to the prices of plantation crops during the early 2000s compelled the farmers of Idukki to search for alternate sources of livelihood. To secure this demand, a dairy project named *Ksheerasagaram Samagra* was designed and launched by Kudumbashree, the State Poverty Eradication Mission of Kerala Government with the support of Department of Animal Husbandry, Kerala (DoAH) in 2009-10.

The other stakeholders were Department of Agriculture, the local self-governance body (known as Panchayath) of Nedumkandam village as well as seven nearby villages, Kerala State Livestock Development Board (KLDB) and State Bank of India (SBI). The project had measures to promote dairy farming with provision of financial assistance for purchase of high yielding cattle, setting up or renewal of cattle sheds and biogas plant and scaling up the fodder cultivation. The beneficiaries were the women dairy producers mobilized by Kudumbashree. Under the project, 98 Joint Liability Groups (JLGs) were formed (group of 5 each) as per the norms set by NABARD - the National Bank for Agriculture and Rural Development. A special committee comprising of the Veterinary surgeon of the village, member of the local self-government organization and the local Bank official were authorized to supervise purchase of the cattle. The dairy development department was entrusted with ensuring the quality checking of the milk of the animal before its purchase. The role of KLDB was to supply hybrid seeds of fodder crops and training to the project participants on scientific dairy farming.

Subsequently, the groups were brought under the ATMA and were reorganized into Commodity Interest Groups (CIGs) in 2014. CIGs of 10-20 dairy entrepreneurs were formed with a leader, deputy leader, and three volunteers for extension, production and marketing and disease control in each group. The extension volunteer was expected to deliver updates on new government schemes and programmes, various livestock services available to the farmers, as well as, information on issues such as vaccination camps and infertility camps. The disease control manager was accountable for assisting in the animal health care management of the respective group members. The production volunteer was tasked to provide technical inputs, e.g. market building for the milk and milk products, fodder cultivation, good practices for calf rearing. The group functioned similar to a self-help group with weekly meetings, thrift collection and micro credit for the group activities. Moreover, each group maintained a demonstration unit in the farm which included at least one of the improved facilities like automatic drinking water system, cattle shed floor mat, fan, chaff cutter, mini milking machine and vermin compost unit. The Kerala Veterinary and Animal Sciences University (KVASU) also extended its support to these groups by organizing training and capacity building programmes for the selected CIG members on various topics like dairy entrepreneurship, fodder production, balanced feeding, cattle health care and value addition in milk (D Anand, 2016, pers. comm., 13 October). Study tours were organized for the group members under the guidance of KVASU to different states to visit dairy plants and high-tech farms.

Increase in the milk production in the project areas was recorded in the following years as a result of these systematic and well-coordinated efforts. But an increase in production has not been reflected in an increase in the price for the milk. Farmers were selling the milk mainly to the milk cooperative societies of Kerala Cooperative Milk Marketing Federation (Milma) or the private dairy firm Malanad Milk Pvt. Ltd, operating in the locality. On average, they were getting only AUD0.549- 0.588(INR 28-30) per litre of the milk. In the last few years though, the various production costs associated with dairy farming have increased substantially, but this was not reflected in the price of the milk. Spiralling cattle feed prices and shortage of adequate green fodder exacerbated the problem to such a level that many farmers even started thinking about quitting dairy farming citing the unprofitability. Realizing these challenges, the district Kudumbashree corroborated the idea of launching a Producer company of these farmers. The company was formally registered in August 2015 and has 382 primary producers having at least two animals as its members. A range of organizations are firmly supporting the Company, viz. DoAH, DDD, Kudumbashree, KVASU, KLDB and District ATMA.

### **Imasree Farmer Producer Company: an evolving localized innovation system**

Imasree is one of the few established producer companies from Kerala in the dairy sector. It was formally registered in August, 2015 with a group of 20 CIGs, each with membership ranging within 10-20. The company has an authorized share capital of AUD9,893 (INR 500,000) and paid up capital of AUD1978.81 (INR 100,000). It is actively involved in agricultural and animal husbandry service activities, except the provision of veterinary activities. The governance of the company is entrusted in a seven member board with a Managing Director, all of whom are primary producers themselves. Only the CIG groups can be its shareholders, with one vote for each group. Individual members contributed \$19.78 (INR 1000) towards the share capital of the company.

Since already established players are already in the market (Milma, Malanad Milk), Imasree has not ventured into other dairy products business as of now. But it is proactive in addressing the members' needs by providing demanded services to its members (Agricultural Development Policy 2015). The company signed a formal contract with the Kerala Feeds Company to ensure timely supply of cattle feed to its members. The margin from the cattle feed business is used by

the Imasree to meet its various operational costs. Presently Kudumbashree and DoAH were actively backstopping Imasree by giving the required policy direction and guidance. KLDB also continue to support to the company by organizing subject matter trainings to its members.

Imasree is presently looking for active market participation of the small holder farmers as a part of this evolving dairy value chain to harness more economic gains. With own branded milk and other dairy value added products, the farmer producer company plans to have its own foothold in the market. Moreover, the other immediate demand is to diversify and strengthen linkages with various actors so as to meet the emerging needs of the dairy producers such as input supply and alternate service providers). The renewed policy focus, articulated by the State (Agricultural Developmental Policy 2015) to support the evolving farmer organizations is expected to invigorate further growth of this small holder governed value chain.

## Methods

### Data collection and Analysis

Idukki, the central district of Kerala with its abundant natural resources and favourable climate offers a congenial atmosphere for dairying. Its geographical coordinates are 9° 51' 0" North, 76° 58' 0" East. The agro-climatic conditions of Idukki are well suited for the cultivation of plantation crops and the district has second place in the State in terms of agricultural production. Dairying forms one of the main subsidiary occupations and source of income for the farmers of the district. Idukki also has a famous dairying history arising from hosting the Indo-Swiss Project at *Mattupetti*, which then subsequently transformed to the KLDB, the largest frozen semen producer in Asia.

In the present study, a cross sectional survey was conducted among the members of Imasree. The population of this study comprised 382 registered members of the farmer producer company at Nedumkandam, Idukki. Snowball sampling design was employed to collect data from 80 farmer members of Imasree. The sampling boundary was determined by following the published table of Israel (1992) for determining the sample size, at a precision level of  $\pm 10$  per cent and at a confidence level of 95 per cent. Data was primarily drawn from the semi-structured interviews conducted with the key actors representing various organizations as well as the 80 members of Imasree in the study area during June to August 2016. For the institutional network mapping (ego network) the participants were identified by contacting the officials of Imasree followed by snowball sampling. The key informants were asked questions about the formal and informal collaboration of their organization with other relevant stakeholders of Imasree using a structured interview schedule. Subsequently network analysis was used to study the pattern of these collaborations following Hartwich & Negro (2010). For mapping the dairy information network of the Imasree (Halder et al. 2016), questions were asked mainly on the primary information sources of the farmers on dairying aspects. A boundary of 3 choices per farmer was deliberately kept to map the network, though it truncates the information system, this approach has been successfully followed in community level studies (Bandiera & Rasul2006). The details of the sampling locales are given in Table 1.

**Table 1. District and village panchayaths selected for the study**

District	Village Panchayaths	Agro ecological zone*	Rainfall pattern**
Idukki	Nedumakandam Rajakkad Rajakumari	All High ranges	I & II

\*Agro-ecological classification according to the classification of Planning Commission, Govt. Of India (2011).

\*\*Pattern I= Both the southwest and north east monsoons are active and moderately distributed.

Southwest monsoon with June maximum (South of 11° North latitude)

Pattern II= Poorly distributed rainfall; South west monsoon with July maximum and concentrated in 3-4 months. North East monsoon relatively weak (North of 11° N latitude)

Social Network Analysis was used to map the innovation system of Imasree as well as the dairy information network among the farmers. Network mapping was done using open source software, viz. Netdraw and Gephi. For quantitative analysis of the social network, Ucinet®6 for Windows (Borgatti, Everett & Freeman 2002) was used.

The institutional network mapping of Imasree depicts its present status and the various partners who form a part of its innovation system. Quantitative analysis reveals the prominence and influence of various actors in this network. Finally, whole network mapping was done to answer the following questions; 1. *Who are the most reliable and frequent information sources on dairying?* 2. *What is the content of the information being exchanged?* and 3. *Whether the*

information exchanges are mutual/frequent or not? These questions were asked to the sampled respondents, the members of Imasree. It was expected that answers to these questions would give sufficient inputs to map the dairy innovation system and to characterize its components.

### Overview of data collection

Semi structured interviews were conducted mainly at the time of field survey by face-to-face interactions with the relevant key informants and actors. An overview of the key informant survey is given in the Table 2.

**Table 2. An overview of key informant interviews conducted with the various stakeholders of Imasree**

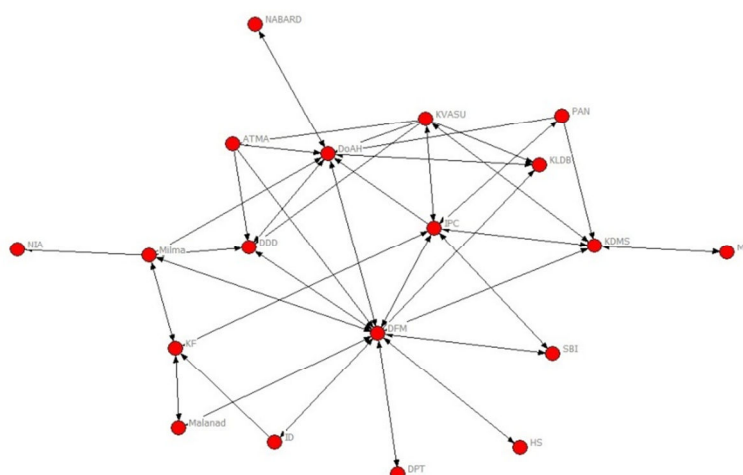
SI no	Actor domain	Actors	Number of actors interviewed
1	Public sector	<b>Knowledge and Service providers</b> Department of Animal Husbandry Dairy Development Department New India Assurance Kerala Feeds Village Panchayath <b>Dairy Research and Development Organizations</b> Kerala Livestock Development Board Kerala Veterinary and Animal Sciences University <b>Linkage Facilitators</b> Kudumbashree ATMA <b>Financing Institutions</b> State Bank of India NABARD	2 1 1 1 1 1 1 2 2 4 1 1 0
2	Private Sector	Malanad Milk Pvt. Ltd. Hay suppliers Dairy product traders Input dealers	2 1 2 2
3	Cooperative Sector	Kerala Cooperative Milk Marketing Federation (Milma)	1
4	Independent	Imasree officials Media	4 0
<b>Total</b>			<b>27</b>

## Results and discussion

### The Institutional network map of Imasree

A comprehensive understanding on the positioning of farmers in relation to other actors in the network in the broader institutional context is of key relevance (Chindime, Kibwika & Chagunda 2016). This would tell in detail about the opportunities they have to co-create and adapt new knowledge, practices and technologies (Klerkx, Hall & Leeuwis 2009), which control their innovation capacity. With this focus the ego network of Imasree was drawn. An overview of this ego network gives an idea about the institutional partners and pattern of linkages among these various actors in the network (Figure 1). The actors from public, private, and cooperative as well as independent domains were mapped to determine the innovation system of Imasree. This revealed the interaction of various actors and the way in which they co-influence each other.

The overall network density (not the density of the actors in the network) indicates the proportion of ties present out of all possible ties linking any two members in a network (Table 3). For the present network, this measure was found to be comparatively low (17.5), indicating the scope for establishing further linkages. Obviously, strengthening linkages among the innovating actors can lead to new and diverse opportunities to promote innovation (Spielman & Kelemework 2007). With the highest betweenness score (59), farmers are the centre of the network, indicating their influence, power and importance in the network. Hence farmers can depend on their collective power to take advantage of their central position by influencing other actors in the network (Chindime, Kibwika & Chagunda 2016). Also, the size of the network is highest for the farmers indicating the level of connectedness of the farmers to other actors in the network (Matuschke 2008).

**Figure 1. Ego network of Imasree Farmer Producer Company****Table 3. Institutional(Ego) Network properties of Imasree**

No	Actors	Size	Ties	Pairs	Density	Reach efficiency	Betweenness
1	ATMA	4	8	12	66.67	46.88	2.00
2	DDD	5	9	20	45.00	47.22	5.50
3	DFM	12	14	132	10.61	39.13	59.00
4	DoAH	9	18	72	25.00	36.96	27.00
5	DPT	1	0	0	0.00	100	0.00
6	HS	1	0	0	0.00	100	0.00
7	ID	2	0	2	0.00	81.25	1.00
8	Imasree	7	11	42	26.19	41.46	15.50
9	KDMS	5	6	20	30.00	55.17	7.00
10	KF	4	0	12	0.00	75.00	6.00
11	KLDB	3	3	6	50.00	55.56	1.50
12	KVASU	6	9	30	30.00	39.39	10.50
13	Malanad	2	0	2	0.00	81.25	1.00
14	MD	1	0	0	0.00	100	0.00
15	Milma	5	6	20	30.00	51.84	7.00
16	NABARD	1	0	0	0.00	100	0.00
17	NIA	1	0	0	0.00	100	0.00
18	PAN	3	3	6	50.00	61.90	1.50
19	SBI	2	2	2	100.00	78.95	0.00

ATMA=ATMA; DDD= Dairy Development Department; DFM= Dairy Farmers; DoAH= Department of Animal Husbandry; HS= Hay suppliers; ID= Input Dealers; IPC= Imasree; KDMS= Kudumbashree; KF= Kerala Feeds; KLDB= KLDB; KVASU= KVASU; Malanad=Malanad Milk Private Limited; MD= Media; Milma= Kerala Cooperative Milk Marketing Federation; NABARD= NABARD; NIA= New India Assurance; PAN= Village Panchayath; SBI= State Bank of India

Reach efficiency is highest for the actors (media, hay suppliers and dairy product traders) who were typical in their functions. This measure tells that these actors are more successful in reaching more actors in the network beyond their primary point of contacts. However, reach efficiency of other important service providers like DoAH, DDD, KLDB, KVASU and Kudumbashree were found to be comparatively low which underscores their lack of reach to other actors to a wider extent in the network (Yauney et al. 2012). The density measure of various actors in the network reflects the extent of utilization of possible linkages and the potential for establishing more linkages to other actors.

The findings of this research suggest that public sector actors with mandates from research to extension to service provision are the major drivers of the innovation system of Imasree. However, efforts to promote market entry and to start the full scale commercial activities of the smallholders seems to be delayed by the public sector's limited experience and capabilities with the market. Also, the extent of participation of some of the public sector institutions (e.g. KVASU), which are crucial in enhancing the innovation capacity of the farmers, were found to

keep changing over the period of time. This may not be good for an evolving innovation system like Imasree. Therefore, the ego network analysis explicitly tells how to support the farmers with better linkages within the network and to strengthen their innovation capacity (Spielman & Kelemework 2007).

### **Characteristics of the innovation system actors of Imasree**

This network is characterized by unique linkage of dairy farmers with a variety of institutions in the public domain including the line departments, Kudumbashree, ATMA, KLDB and most importantly KVASU as well as with private stakeholders like Hay suppliers, Input dealers (Fig.1). ATMA had direct linkage with the farmers as it had played an important role in organizing the farmers into CIGs in association with KVASU.

**Table 4. Innovation system Framework of Imasree**

SI no	Actors	Key activities
<b>A Public sector</b>		
1	DoAH	Technical service delivery Training programmes for the members of Imasree Consultancy and advisory services Monitoring the activities of Imasree
2	DDD	Milk quality checking and certification Extension and advisory services
3	KVASU	Training and capacity building programmes and study tours
4	KLDB	Training on Ration Feed balancing programme for the members Supply of fodder seeds to farmers Supply of quality semen to farmers
5	Kudumbashree	Organization of women into JLGs Policy guidance to Imasree Linkage facilitation with other stakeholders
6	State Bank of India	Financing the credit needs
7	Kerala Feeds	Cattle feed supply contract with Imasree at a subsidized rate
8	ATMA	Organizing the CIGs of dairy producers Training and capacity building programmes Seed money to CIGs Funding for exposure visits
9	Village Panchayath	Arranging for logistical support to Imasree Monitoring the performance of Imasree
10	New India Assurance	Cattle Insurance to the members of Imashree
11	NABARD	Funding support to SHGs
<b>B Private Sector</b>		
12	Malanad Milk Pvt. Ltd.	Market linkage to members of Imasree Provision of dairy farming inputs and services
13	Hay Suppliers	Supply of hay for the cattle growers
14	Dairy Product Traders	Sale and Supply of dairy products
15	Input Dealers	Supply of necessary inputs Informal information agents of the farmers
<b>C Cooperative Sector</b>		
16	Kerala Cooperative Milk Marketing Federation	Market linkage for milk Input supply (cattle feed and feed supplements) Provision of other relevant services
<b>D Independent</b>		
17	Imasree	Farmer producer organization which govern the dairy value chain Support to the farmers through provision of necessary services
18	Media	Publicity for the activities of Imasree

Though the stakeholder scenario is diverse and portrays the influence of the actors on farmers of Imasree, the strength of linkages varies considerably among the actors. This was revealed during the key informant survey conducted with these stakeholders. Farmers had different milk marketing alternatives like Milma and Malanadmilk. Milma, (State Cooperative Milk Marketing Federation) tries to offer a fair price to the producer. On the other hand, Malanad milk, a private company tries to expand its supplier network by providing a price better than Milma, though the difference is marginal. However, both these players maintain a balance in keeping the milk price to a certain level. Farmers are in a strong position in the network because whenever there is even a marginal increase in the milk price by either Milma or Malanad they switch over their milk supply accordingly. Though formed recently, Imasree also positions strongly in the network by connecting itself well with the important actors like KVASU, Kudumbashree and KLDB. Though the linkage with DoAH is operational it is not considered a strong one by the Imasree and needs further reinforcement. Some of the important links, such as that between the

farmers and Kerala Feeds, were not directly established as this was routed via other actors like Imasree and Milma. Sustained focus on dairy development with the implementation of many projects and programmes resulted in bringing a variety of actors in the ego network of Imasree farmers. The innovation system framework with the key roles performed by various actors of IMPC is given in the table 4. The activities of these stakeholders are receiving adequate policy support of the State such as Agricultural Development Policy, Dairy Entrepreneurship Development Scheme (2009) of DoAH as well as National Agricultural Development Policy (2007) of the central government.

### **Whole network analysis of Imasree**

#### ***a. Descriptive measures***

Various descriptive measures of the network properties of Imasree are summarized in the following Table 5. The density is low (2 per cent). It hints at underlying potential of establishing further linkages among the various actors. Mean *degree* (2.51) and *betweenness* (48.3) and *in closeness* (1.17) centrality measures of this network imply the corresponding average centrality measures of the actors in the network. Veterinary surgeons of the village as well as nearby localities were also playing a key role in the information and technical service provision for the farmers, as evident from the network map (Figure 2).

**Table 5. Descriptive measures of whole network of Imasree**

			<b>In degree centrality</b>				<b>Out degree centrality</b>				<b>Betweenness centrality</b>				<b>In closeness centrality</b>			
X1	X2	X3	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
0.020	269	2.51	2.51	3.40	0.0	20	2.51	1.95	0.0	7.0	48.3	93.7	0.0	485	1.17	0.33	0.93	2.75

X1= Density; X2= No. of ties; X3= Average degree

#### ***b. Whole network centrality measures***

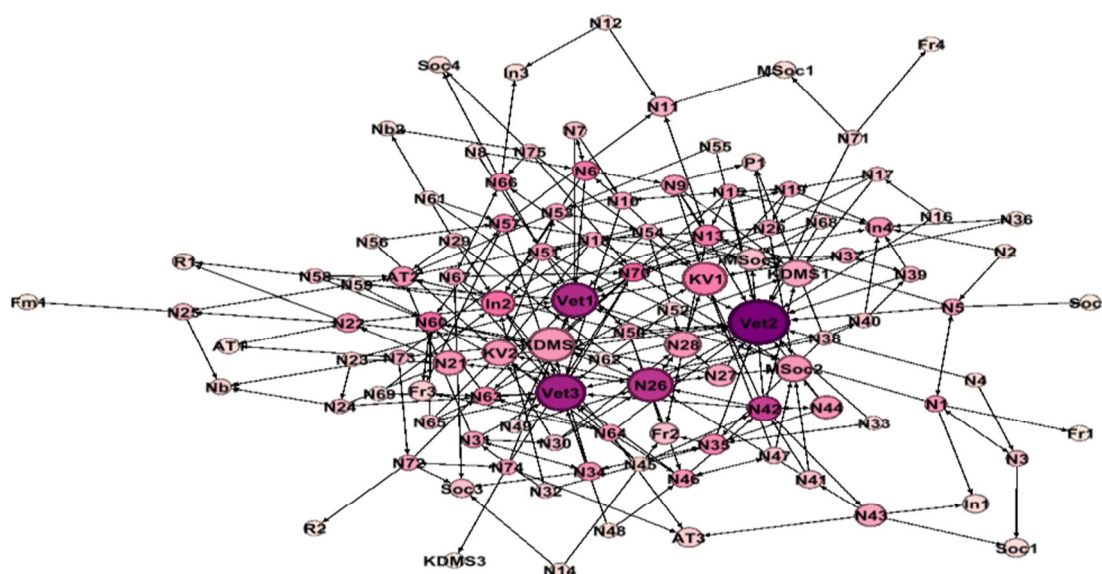
All the 3 actors with highest *in degree* measures were Government veterinarians of Nedumkandam and neighbouring Panchayaths (Table 6). Obviously, farmers of Imasree were dependent on these legitimate information sources for various dairying aspects. Though not scored, high some other actors like officials of Kudumbashree (KDMS1, KDMS2), subject matter expert of KVASU (KV2) and a farmer (N26) also had high *in degree* scores as evident from their size and colour in the whole network map. The findings are similar to the observations of Spielman, Ekboir & Davis (2009). Also, the chief information seekers were traced through the mapping (N42, N70 and N22) with highest *out degree* scores.

**Table 6. Whole network properties of Imasree**

<b>Degree centrality</b>				<b>Closeness centrality</b>				<b>Betweenness centrality</b>	
<b>In degree</b>		<b>Out degree</b>		<b>In closeness</b>		<b>Out closeness</b>		<b>Ego (ID)</b>	<b>Score</b>
<b>Ego (ID)</b>	<b>Score</b>	<b>Ego (ID)</b>	<b>Score</b>	<b>Ego (ID)</b>	<b>Score</b>	<b>Ego (ID)</b>	<b>Score</b>		
Vet2	20	N42	7	Vet1	2.75	N73	2.00	N42	484
Vet3	17	N70	6	Vet2	2.28	N74	1.94	N46	433
Vet1	16	N22	6	Fr2	2.03	N72	1.93	N26	426

The key information brokers were N42, N46 and N26 with highest *betweenness* measures, lying in the shortest path between most numbers of other actors in the network. But, while the actors from the other domains like cooperative/private were prominent in the dairy value chain, they did not have a prominent role in the whole network in terms of the centrality measures. The actor with the highest *in closeness* measure is the most globally central actor (Haythornthwaite 1996). Actors with (Vet1, Vet2, Fr2) had high *in closeness* centrality indicating their level of integration while those with high *out closeness* were lying at the periphery of the network meaning their isolation from other actors. In general, these actors with high centrality measures were considered as the most important channels of communication regarding dairy farming within the community. Based on their strategic location in the network, an actor could play different roles viz. central connectors, boundary spanners, information brokers and peripheral specialists (Chan & Liebowitz, 2006). All these information inputs have policy relevance while designing the training and capacity building programmes for the dairy producers of Imasree. Thus, the whole network map (Figure 2) provides a comprehensive understanding on the functional innovation system of Imasree.

**Fig 2. Whole network of ImasreeFarmerProducerCompany**



N1-N80: Dairy Farmers; H: Hay Supplier; Vet: Veterinary Doctor; Nb: Neighbour farmer; R: Relative farmer; In: Input Agent; F: Family Members; Pan: Panchayath Official; SoC : Official of Milma Coop. Society; M Soc: Official of Malanad Milk Private Limited; Pr : Progressive farmer; KDMS : Kudumbashree official; KV : Expert of KVASU; AT: ATMA field coordinator; Fr: Farmer’s Friend  
 Note: Size and colour of the nodes are proportional to the degree centrality of that particular actor in the network.

Finally based on the available information inputs on dairying social capital among the actors in the network, the characteristics of the social ties were analysed to see the nature of the innovation system and its strength (Table 7).

**Table 7. Characteristics of the social ties of the social learners in Imasree Farmer Producer Company**

IFPC	Nature of the ties (Number)						Direction (Number)		Strength (Number)	
	A (%)	B (%)	C (%)	D (%)	E (%)	F (%)	Mutual (%)	One way (%)	Strong (%)	Weak (%)
n=269	23 (8.55)	38 (14.12)	53 (19.70)	32 (11.89)	73 (27.13)	50 (18.58)	188 (69.90)	81 (30.11)	123 (45.72)	146 (54.27)

n =Total number of ties in the network  
 A= Cattle feeding related information  
 B=Cattle breeding related information  
 C= Cattle management related information  
 D= Any other dairy related information including related to marketing  
 E= A combination of any of the above two information domains  
 F= A combination of any of the above three information domains

In the network, social ties were mainly utilized (27%) for obtaining information from more than one domain. A majority of the social ties were bidirectional (70%) indicating the reciprocal flow of information and the interaction of the farmers with their reported information sources which were less frequent for the majority (54%) and thus characterized as weak linkages. Nevertheless, within a network, both the strong ties and weak ties were equally relevant in facilitating the information flow (Bandiera & Rasul 2006). These unique features of the social ties are important in governing the interactions among the members of Imasree (Haythornthwaite 1996; Hersberger 2003)and hence decide their collective innovation capacity. Thus, these inputs can enable changes in the planned dairy related information interventions for the members of Imasree.

The case of Imasree could be seen as the emergence of a local innovation system with the involvement of multiple actors, working in collaboration to support the local dairy producers. These stakeholders, mainly from the public domain, have forged alliances and partnerships to shape the innovation system, which propelled its growth. The knowledge and service providers along with dairy research institutions mainly developed paternalistic linkages that ensured flow of information and services relevant for dairying through means of formal communication,



trainings and networking (T Shyne 2016, pers. comm., 22 October). Other public sector actors like the linkage facilitators catalysed the growth of the Company by promoting more linkages with a choice of knowledge and service providers as well as financing institutions. Thus it could be concluded that these collaborative networks and linkages were crucial in shaping the Imasree and ensuring its sustainability through institutionalization. The study also accentuates the need to enhance the participation of the existing stakeholders beyond their conventional roles. For example, DoAH, KVASU, Kudumbashree had innovated themselves and adapted new mandates to play critical roles in the emergence of Imasree. With the whole network analysis, important actors with high centrality measures were determined by the network mapping. Further, the connections among the dairy producers were found to be more interactive and conducive enough to promote mutual learning in the network. This has potential implications for the extension agencies while designing information interventions on dairying for the members of Imasree at the micro level. Though the innovation system was evolved with an objective to provide an alternate livelihood to the farmers of the locality, with the passage of time the focus has shifted to commercial dairying, as it achieved the stated objective.

## Conclusion

This study gave strong evidence for the role and significance of diverse actors of different domains in supporting the evolving value chains governed by the small holder producers through their synergistic actions, in line with the innovation system thinking. Also, it reiterates the need for the public sector institutions to innovate themselves by redefining the linkages and revisiting their policy outlook, to cater for the emerging demands of the farmers in the dynamic agricultural context.

## Acknowledgements

We would like to acknowledge the contribution of Dr. Deepa Ananad, Assistant Professor, Kerala Veterinary and Animal Sciences University for her valuable inputs in making this paper. Also the contribution of officials of Kudumbashree, Imasree and Livestock Department are duly acknowledged.

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