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Information Sharing among Actors in Dairy Innovation Platforms

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Dairy farming is a cornerstone of global food security, serving as a primary source of nutrition for a burgeoning world population. Information sharing, a fundamental practice of exchanging knowledge and data, plays a pivotal role in enhancing the dairy sector's productivity and sustainability. This study delves into the intricacies of information exchange within the context of dairy innovation platforms (IPs) dynamic collaborative spaces where diverse stakeholders, including farmers, researchers, input suppliers and extension personnels etc., converge to address common

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challenges. Taking place both physically and virtually, dairy IPs facilitates collective problem-solving, with each member contributing their unique expertise to foster a win-win collaborative environment. This research article draws from a comprehensive investigation conducted in Haryana (India), focusing on two districts with substantial bovine populations i.e., Karnal and Hisar. These districts are home to multiple agricultural research institutes, universities and innovation platforms actively engaged in the dairy sector. Data were gathered randomly from 140 dairy actors, that includes researchers, extension personnels, input suppliers and dairy farmers, all with a minimum of five years of experience in their respective fields. Information sharing was evaluated through responses to specific dairy-related topics such as breeding, feeding, healthcare and management practices, collected during March 2017. Our findings reveal a dynamic landscape of information sharing among different actors within the dairy innovation platform. Researchers emerge as key contributors to topics like animal breeding (27.87%) and extreme weather control, while extension personnel excel in areas like pregnancy diagnosis and disbudding. Dairy Farmers, constituting the largest group, exhibit a keen interest in concentrate composition and green fodder types. Dairy farming serves as a critical pillar in meeting the nutritional needs of our ever-expanding global population and the information sharing is fundamental to enhancing its productivity and sustainability.

Keywords: Innovation platforms (IPs); dairy actors; information sharing; dairy farming.

1. INTRODUCTION

Dairy farming holds a pivotal position in fulfilling the nutritional requirements of an ever-expanding global population. Effective information exchange becomes a key component of sustainable dairy production as we manage the difficulties of feeding a growing world. Information sharing is the practice of exchanging knowledge and data between individuals and institutions, serves as a catalyst for progress in this dynamic field. The exchange of insights, strategies, and best practices is not only crucial for addressing the pressing needs of the dairy sector but also for promoting collaboration among diverse stakeholders.

The conduits for such information exchange often emerge in the form of innovation platforms (IPs), which serve as dynamic spaces where a diverse array of actors come together to pool their knowledge and resources. In these forums, interactions take place physically or virtually, fostering collective problem-solving and collaboration and ultimately contributing to a win-win scenario [1,2]. Within the realm of agricultural research and development, IPs has proven to be effective in addressing multifaceted challenges.

Some notable examples of IPs in the realm of agricultural research and development are worth mentioning. In the Fodder Adoption Project, led by the International Livestock Research Institute in Ethiopia, IPs were employed to enhance livestock feeding practices. The Forum for Agricultural Research in Africa (FARA) champions the use of IPs in integrated agricultural research for development programs, encompassing productivity, markets, natural resource management and policy issues [3-6]. In India, the National Dairy Research Institute, Karnal, leverages IPs by integrating all actors through initiatives like the Farmers Field School (FFS) and Dairy Melas. Additionally, Krishi Vigyan Kendra (KVK) and the Agricultural Technology Information Centre (ATIC) offer platforms for interaction among diverse stakeholders on an annual basis.

An innovation platform, at its core, can be seen as 'a space for learning and change.' It is an assembly of individuals, often representing various organisations, with diverse backgrounds and interests. These members encompass a spectrum of roles, including farmers, traders, food processors, researchers, and government officials. They unite with the common goal of diagnosing problems, identifying opportunities, and devising strategies to attain shared objectives. The collective strength lies in their ability to design and implement activities as a platform or coordinate individual actions among members [7].

To further the cause of dairy productivity and sustainability, the dissemination of information and knowledge exchange among key stakeholders in the dairy sector is imperative. Dairy innovation platforms (IPs) emerge as vital arena where researchers, extension personnel, input suppliers and farmers collaborate and share information on various facets of dairy

farming. These facets encompass animal breeding, feeding, healthcare and management practices, each of which plays an integral role in enhancing the sector's efficiency, sustainability and overall success.

This research article embarks on a comprehensive analysis of information sharing within the dairy innovation platform, shedding light on the dynamics and knowledge flow among different actors. By delving into the intricacies of information sharing on animal breeding, feeding, healthcare and management practices, we aim to contribute to a deeper understanding of how these stakeholders collaborate, what knowledge gaps exist and how the dairy sector can harness the power of innovation platforms for a more sustainable future.

2. METHODOLOGY

The study was conducted in Haryana. The ex-post-facto research design was adopted for this study since the phenomenon has already occurred. Purposively one district in each region i.e. Eastern region and Western region was selected. Thus a total of two districts were selected purposively based upon highest bovine population. These two districts are active areas of Innovation Platform. Karnal is having four ICAR research institutes namely NBAGR (National Bureau of Animal Genetic Resources), CSSRI (Central Soil Salinity Research Institute), IIWBR (Indian Institute of Wheat And Barley Research), and NDRI (National Dairy Research Institute). Two regional sub stations of SBI (Sugarcane Breeding Institute) and IARI (Indian Agriculture Research Institute). It also has one Krishi Vigyan Kendras of NDRI Karnal and one Krishi Gyan Kendra of CCSHAU (Chaudhary Charan Singh Haryana Agricultural University) Uchani. While, Hisar has two universities namely CCSHAU (Chaudhary Charan Singh Haryana Agricultural University) and LUVAS (Lala Lajpat Rai University of Veterinary and Animal Sciences).

The data collected was from 140 actors (n), including 20 researchers (n_1), 20 extension personnels (n_2), 20 input suppliers (n_3) and 80 farmers (n_4) involved in the dairy innovation platform with at least 5 years of experience in their respective fields were selected randomly. Farmers were having milch animals at the time of investigation. Information sharing was assessed through their responses to specific dairy-related topics, such as breeding, feeding, healthcare and management practices. All actors agreed to answer for the questionnaires and gave their consent prior to data collection during March 2017. Here, n means total number of actors from Innovation Platform considered for the research, whereas n_1, n_2, n_3 and n_4 refers to researchers, extension personnels, input suppliers and farmers respectively.

The actors sharing of information to each other were analysed on concerned dairy farming practices like Animal Breeding, Animal Feeding, Animal Healthcare and Dairy Management Practices by using semi-structured interview schedule. It was measured by calculating the sharing of information in dairy innovation platform by the dairy actors to farmers. The data were collected against each item listed in the interview schedule. The numerical scores of 1 for No contribution, 2 for Less contribution, 3 for Moderate contribution, 4 for High contribution and 5 for Very High contribution were assigned and thus obtained against each item was totaled up to get overall average weighted score of information sharing by the actors on dairy innovation platform to the farmers.

3. RESULTS AND DISCUSSION

3.1 Sharing of Information on Animal Breeding Practices by the actors in Dairy Innovation Platform

3.1.1 Proper time of insemination

Researchers have the highest average score of 29.71, suggesting they possess the most knowledge in this area. Farmers have the second-highest average score of 28.69, indicating that they have significant knowledge regarding the proper time of insemination. Extension personnel and input suppliers have slightly lower scores, implying that they might benefit from more information sharing on this aspect.

3.1.2 Service period

Extension personnel have the highest average score of 28.95, indicating that they are more knowledgeable about the service period in animal breeding. Researchers also score relatively high at 27.24. Farmers and input suppliers have lower scores, suggesting a potential area for improvement in their knowledge.

3.1.3 Pregnancy diagnosis

Farmers have the highest average score of 26.77, suggesting that they are well-informed about pregnancy diagnosis. Extension personnel also have a reasonably high score of 26.55. Researchers and input suppliers have lower scores, indicating room for improvement in knowledge sharing on this topic.

3.1.4 Breed improvement

Researchers have the highest average score of 30.62, indicating they are most knowledgeable about breed improvement practices. Input suppliers have the second-highest score of 24.23, suggesting that they have some knowledge in this area. Extension personnel and farmers have lower scores, indicating a potential need for more information sharing on breed improvement.

3.1.5 Pooled (overall average score)

Researchers have the highest average score of 27.87 when considering all aspects, showing their overall strong knowledge in animal breeding practices. Extension personnel and input suppliers have intermediate scores. Farmers have the lowest pooled average score of 25.08, indicating a potential need for more information sharing and education in various aspects of animal breeding practices.

In summary, the analysis of the table reveals that researchers generally possess the highest knowledge in all aspects of animal breeding practices. Farmers, while having good knowledge in some areas, may benefit from more information sharing and training in other aspects of breeding. Extension personnel and input suppliers fall somewhere in between, indicating they also have room for improvement in certain areas. This data highlights the importance of effective knowledge sharing and collaboration among the different stakeholders in the Dairy Innovation Platform to enhance animal breeding practices and overall dairy production.

A look on Table 1, reveals that there was increased share of information by researchers (30.62%) followed by the maximum information shared on service period by extension personnels (28.95%). Further, the maximum information shared by farmers (26.77%) on pregnancy diagnosis and input suppliers on breed improvement (24.23%).

3.2 Sharing of Information on Animal Feeding Practices by the actors in Dairy Innovation Platform

3.2.1 Concentrate feeding

Researchers have the highest average score of 27.33, indicating a strong understanding of concentrate feeding. Extension personnel, input suppliers, and farmers have relatively similar scores, suggesting a moderate level of knowledge among these groups.

3.2.2 Composition of concentrates

Researchers and farmers have the same average score of 25.43, indicating a comparable level of knowledge regarding concentrate composition. Extension personnel and input suppliers also have similar scores, albeit slightly lower than researchers and farmers.

3.2.3 Fodder seeds

Input suppliers have the highest average score of 26.79, indicating they possess the most knowledge about fodder seeds. Extension personnel and farmers have similar scores, while researchers have a slightly lower score in this aspect.

Table 1. Sharing of information on Animal Breeding practices by the actors in Dairy Innovation Platform (n = 140)

Particulars	Researchers (n_1 = 20)	Extension personnels (n_2 = 20)	Input suppliers (n_3 = 20)	Farmers (n_4 = 80)
Proper time of insemination	29.71	22.34	19.26	28.69
Service period	27.24	28.95	21.52	22.29
Pregnancy diagnosis	23.98	26.55	22.70	26.77
Breed improvement	30.62	22.47	24.23	22.69
Pooled	27.87	25.18	21.87	25.08

3.2.4 Silage

Input suppliers have the highest average score of 28.57, indicating a high level of knowledge about silage. Extension personnel and farmers have similar scores, while researchers have the lowest score in this aspect.

3.2.5 Mineral mixture

Researchers have the highest average score of 28.45, indicating a strong understanding of mineral mixtures. Extension personnel and input suppliers have similar scores, while farmers have a slightly lower score.

3.2.6 Colostrum feeding

Researchers and farmers have the same average score of 25.93, indicating comparable knowledge regarding colostrum feeding. Extension personnel and input suppliers also have similar scores, though slightly lower than researchers and farmers.

3.2.7 Quantity and type of green fodder

Extension personnel have the highest average score of 26.29, indicating they are most knowledgeable about the quantity and type of green fodder. Input suppliers have the second-highest score, while researchers and farmers have lower scores.

3.2.8 Feed supplements

Farmers have the highest average score of 28.10, indicating they possess the most knowledge about feed supplements. Researchers, extension personnel, and input suppliers have similar but lower scores in this area.

3.2.9 Pooled (overall average score)

Researchers have the highest pooled average score of 25.08, demonstrating strong overall knowledge in animal feeding practices. Extension personnel, input suppliers, and farmers all have fairly similar pooled average scores, indicating a consistent level of knowledge across these groups.

In summary, this table reveals variations in knowledge levels among different stakeholders regarding various aspects of animal feeding practices. Researchers tend to excel in many areas, while input suppliers and extension personnel also show strengths in specific aspects. Farmers, while having strengths in certain areas, may benefit from additional information sharing and training in various aspects of animal feeding practices. This highlights the importance of collaboration and knowledge exchange within the Dairy Innovation Platform to optimize animal feeding practices and enhance overall dairy production. Furthermore, it emphasizes the need for targeted interventions to improve knowledge gaps and promote best practices across all stakeholder groups.

From the Table 2, it reveals that there was increased share of information by input suppliers (28.57%) on silage followed by the maximum information shared on mineral mixture by researchers (28.45%). Further, the maximum information shared by farmers (28.10%) on feed supplements and extension personnels on quantity and type of green fodder (26.29%).

Table 2. Sharing of information on Animal Feeding practices by the actors in Dairy Innovation Platform (n = 140)

Particulars	Researchers (n_1 = 20)	Extension personnels (n_2 = 20)	Input suppliers (n_3 = 20)	Farmers (n_4 = 80)
Concentrate feeding	27.33	23.56	24.44	24.67
Composition of concentrates	25.43	23.48	25.65	25.43
Fodder seeds	23.79	24.71	26.79	24.71
Silage	22.08	24.24	28.57	25.11
Mineral mixture	28.45	24.48	23.43	23.64
Colostrum feeding	25.93	24.07	25.93	24.07
Quantity and type of green fodder	23.71	26.29	25.35	24.65
Feed supplements	23.57	24.29	24.05	28.10
Pooled	25.08	24.37	25.53	25.02

3.3 Sharing of Information on Animal Healthcare Practices by the actors in Dairy Innovation Platform

3.3.1 Naval cord

Extension personnel have the highest average score of 30.59, indicating a strong understanding of naval cord care. Researchers and farmers have moderate scores, while input suppliers have the lowest score in this area.

3.3.2 Disbudding

Researchers have the highest average score of 26.54, suggesting a good knowledge of disbudding practices. Input suppliers have the second-highest score, while extension personnel and farmers have lower scores.

3.3.3 Control of endo & ecto-parasites

Extension personnel have the highest average score of 30.89, indicating a strong knowledge of parasite control. Researchers also have a relatively high score, while input suppliers and farmers have lower scores.

3.3.4 First aid kit

Extension personnel have the highest average score of 26.59, indicating strong knowledge of first aid kit requirements. Researchers, farmers, and input suppliers have comparable but slightly lower scores.

3.3.5 Vaccination

Researchers have the highest average score of 27.54, indicating good knowledge about vaccination. Extension personnel also have a strong score, while input suppliers and farmers have lower scores.

3.3.6 Prolapse management

Researchers have the highest average score of 25.30, indicating a good understanding of prolapse management. Extension personnel, farmers, and input suppliers have comparable scores, with extension personnel having the second-highest score.

3.3.7 Treatment of anoestrus and repeat breeding

Researchers have the highest average score of 30.55, indicating strong knowledge in treating anoestrus and repeat breeding. Extension personnel also have a high score, while input suppliers and farmers have lower scores.

3.3.8 Mastitis control

Extension personnel have the highest average score of 29.97, indicating a strong understanding of mastitis control. Researchers and farmers have moderate scores, while input suppliers have the lowest score.

3.3.9 Abortion control

Input suppliers have the highest average score of 25.34, indicating strong knowledge about abortion control. Researchers, extension personnel, and farmers have similar but slightly lower scores.

3.3.10 Pooled (overall average score)

Extension personnel have the highest pooled average score of 27.58, demonstrating strong overall knowledge in animal healthcare practices. Researchers also have a relatively high pooled score. Input suppliers and farmers have comparable but lower pooled scores.

In summary, Table 3 shows varying levels of knowledge among different stakeholders regarding various aspects of animal healthcare practices. Extension personnel and researchers tend to have strong knowledge in multiple areas. Input suppliers show expertise in some areas, such as abortion control and parasite management. Farmers, while having strengths in certain aspects, may benefit from additional information sharing and training in several healthcare practices. This emphasizes the importance of collaboration and knowledge exchange within the Dairy Innovation Platform to optimize animal health and welfare, leading to improved dairy production. Targeted interventions and capacity building may be necessary to bridge knowledge gaps among these groups.

From the Table 3, it showed that there was increased share of information by input suppliers (30.59%) on naval cord treatment followed by the maximum information shared on treatment of anoestrus and repeat breeding by researchers (30.55%). Further, the maximum information shared by farmers (25.55%) on prolapsed management and extension personnels (26.29%).

Table 3. Sharing of information on animal healthcare practices by the actors in dairy innovation platform (n = 140)

Particulars	Researchers (n_1 = 20)	Extension personnels (n_2 = 20)	Input suppliers (n_3 = 20)	Farmers (n_4 = 80)
Naval cord	23.43	30.59	21.04	24.95
Disbudding	26.54	23.87	26.34	23.25
Control of endo & ecto parasite	25.40	30.89	22.65	21.05
First aid kit	22.82	26.59	25.18	25.41
Vaccination	27.54	28.22	23.02	21.22
Prolapse management	24.82	25.30	24.33	25.55
Treatment of anoestrus and repeat breeding	30.55	27.09	20.57	21.79
Mastitis control	25.61	29.97	21.78	22.65
Abortion control	24.20	25.11	25.34	25.34
Pooled	25.73	27.58	23.28	23.40

3.4 Sharing of Information on Animal Management Practices by the Actors in Dairy Innovation Platform

3.4.1 Clean milk production

Farmers have the highest average score of 26.44, indicating a strong understanding of clean milk production. Extension personnel also have a relatively high score, while researchers and input suppliers have slightly lower scores.

3.4.2 Control of mosquitoes and ticks

Extension personnel have the highest average score of 30.66, showing a strong knowledge of mosquito and tick control. Researchers and farmers have moderate scores, while input suppliers have the lowest score in this area.

3.4.3 Bedding material

Researchers have the highest average score of 26.08, indicating a good understanding of bedding material practices. Farmers, extension personnel, and input suppliers have comparable scores, although slightly lower than researchers.

3.4.4 Cleaning of cattle shed

Extension personnel have the highest average score of 29.78, indicating a strong knowledge of cattle shed cleaning. Researchers have a relatively high score, while farmers and input suppliers have lower scores.

3.4.5 Milking machines

Input suppliers have the highest average score of 26.00, showing their expertise in milking machine usage. Researchers and farmers have moderate scores, while extension personnel have a slightly lower score.

3.4.6 Manure management system

Extension personnel have the highest average score of 27.32, indicating a strong understanding of manure management. Researchers and farmers have moderate scores, while input suppliers have a lower score.

3.4.7 Farm records

Input suppliers have the highest average score of 25.82, indicating good knowledge of farm record keeping. Extension personnel and farmers have similar scores, while researchers have a slightly lower score.

3.4.8 Extreme weather control

Researchers have the highest average score of 30.47, indicating a strong understanding of extreme weather control. Farmers also have a relatively high score, while extension personnel and input suppliers have lower scores.

3.4.9 Pooled (overall average score)

Extension personnel have the highest pooled average score of 26.25, demonstrating strong overall knowledge in animal management practices. Researchers also have a relatively high pooled score. Farmers and input suppliers have comparable but slightly lower pooled scores.

In summary, Table 4 shows varying levels of knowledge among different stakeholders

Table 4. Sharing of information on animal management practices by the actors in dairy innovation platform (n = 140)

Particulars	Researchers (n_1 = 20)	Extension personnels (n_2 = 20)	Input suppliers (n_3 = 20)	Farmers (n_4 = 80)
Clean milk production	24.52	25.96	23.08	26.44
Control of mosquito, ticks.	24.10	30.66	21.35	23.89
Bedding material	26.08	24.49	24.72	24.72
Cleaning of cattle shed	26.76	29.78	22.54	20.93
Milking machines	24.53	23.90	26.00	25.58
Manure management system	26.05	27.32	20.58	26.05
Farm records	23.94	25.35	25.82	24.88
Extreme weather control	30.47	22.09	20.04	27.40
Pooled	25.88	26.25	22.90	24.97

regarding various aspects of animal management practices. Extension personnel and researchers tend to excel in multiple areas, with researchers particularly strong in extreme weather control. Input suppliers show expertise in specific aspects like milking machines and farm records. Farmers, while having strengths in certain areas, may benefit from additional information sharing and training in multiple management practices. This underscores the importance of collaboration and knowledge exchange within the Dairy Innovation Platform to enhance animal management and improve dairy production. Addressing knowledge gaps among these groups can lead to more efficient and sustainable dairy farming practices.

From Table 4, it was further analyzed and found that there was increased share of information by extension personnels (30.66%) on Control of mosquito, ticks etc. followed by the maximum information shared on extreme weather control by researchers (30.47%). Further, the maximum information shared by farmers (26.44%) on clean milk production and input suppliers (26.00%) on milking machines.

From the above analysis the cursory look reveals that researchers have the highest scores in topics like "breed improvement" and "extreme weather control" while extension personnels excel in "pregnancy diagnosis" and "disbudding". Farmers, who constitute the largest group, show a strong interest in "composition of concentrates" and "quantity and type of green fodder". The role of extension personnel is more proactive in sharing important information related to dairy farming [8]. Innovation Platform comprises of different intermediary actors to build bridges between the different components in innovation systems, that makes the platform effective with different innovation intermediaries enabling them to be complementary and helps in monitoring adaptive management of innovation through innovation platforms [9].

4. CONCLUSION

This study emphasizes the pivotal role of innovation platforms in promoting information sharing in dairy farming. Better understanding of local institutions embedded in norms and values is crucial to change people's practices and decisions. As there is often weak linkages among actors in the innovation system, brokers have a vital role to play to facilitate these inclusive innovation processes [10]. The results indicate that information sharing among actors within the dairy innovation platform varies across different aspects of dairy farming. Researchers excel in breed improvement and extreme weather control, while extension personnel specialize in pregnancy diagnosis and disbudding. Farmers primarily seek information on concentrate composition and green fodder types. Most of the dairy information was shared by researchers on animal breeding practices, input suppliers on animal feeding practices, extension personnel on animal healthcare practices. It was also observed that extension personnel shared maximum information on dairy management practices. In overall, it can be inferred that the dairy information shared by the actors from dairy innovation platform was maximum by extension personnel. Dairy farming serves as a critical pillar in meeting the nutritional needs of our ever-expanding global population and the information sharing is fundamental to enhancing its productivity and sustainability. This research underscores the potential of dairy IPs as dynamic spaces that foster collective problem-solving, enabling diverse stakeholders to contribute their

unique expertise, ultimately creating a win-win collaborative environment.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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