Analyzing Extension and Advisory Service Delivery Dynamics in Nepal through Social Network Analysis Lens: A Comparative Study

Abstract

Aims: Amid the changes in extension and advisory service delivery after federalism in Nepal. The existing players and new players in the network influence the flow and accessibility of services, providing both opportunities and challenges. However, very few studies have been carried out. So, this research was designed to analyze the perception and diffusion flow pattern (mediators) of public extension and advisory services at the local/municipal level in Nepal.

Study Design: A cross-sectional research approach with a convergent parallel mixed-method research design was used.

Methodology: A field survey was carried out by selecting 200 stakeholders using a simple random sampling method, 22 key informant interviews, and 4 focus group discussions at Chandragiri and Dakshinkali municipalities.

Results: The five-point Likert Scale(13 constructs), social network analysis, and community network map revealed that the EAS network with progressive farmers (C_B= 2384.94), agriculture section (C_B= 1134.8), input suppliers(C_B= 855.21), farmers group (C_B= 511.7), and social actors (C_B= 452.58) as strong mediators, had a poor perception toward current public extension and advisory services. The EAS network with agriculture section(C_B= 2292), farmers group (C_B= 2199.5), input suppliers (C_B= 584.32,) and progressive farmers (C_B= 481.9) as their strong mediators in the EAS network perceive the public EAS slightly positively.

Conclusion: The research concludes that the mediator's stakeholders and neglected stakeholders by government institutions but perceived strong mediators in the EAS network must be identified and prioritized. The study could be a basis for the stakeholders' identification and management of Nepal's service delivery at the municipal/local level.

Keywords: Social Network Analysis; Likert Scale, Perception, Extension and advisory services, Diffusion

1. Introduction

Extension and advisory services consist of different information and services activities to empower farmers and rural people's technical, organizational, and management capabilities to enhance their livelihoods and general well-being [1,2]. It tries to lock the gap between research and service recipients (farmers) by transferring the knowledge flow in both ways to improve the overall welfare of the farmers (Bourne et al. 2017). However, the scope of the extension and advisory services change over time. At an early stage, it is viewed merely as a technology transfer. After trade liberalization and globalization, EAS has gone beyond the scope of technology transfer as diverse clientele have diverse needs and demands (Prasad, Sulaiman, and Mittal 2015). It is now viewed as a means for facilitating social learning and participatory learning through a multidisciplinary point of view [1,5].

Traditional extension and advisory systems focused on the centralized and top-down linear approach of EAS delivery. It focuses simply on the knowledge and technology transfer to the end user by persuading them to adopt the end product rather than involving them in the process (Davis and Sulaiman 2014; Ritesh et al. 2022). The government of Nepal has introduced the T and V approach, Tuki approach, integrated rural development approach, and so on based on the principle of transfer of technology (Dhital 2017). This linear EAS service delivery approach fails to address the problem of the diverse and complex farming system and the farmers involved—these demands for the paradigm shift in extension and advisory service [7,8]. The progressive change in the extension services paradigm shifts demand for more decentralized, participatory, market-oriented, and demand-driven extension services (Hagmann et al. 2014; Kidd et al. 2000). Over time the government of Nepal has introduced a series of different extension approaches i.e., FSR/E, Pocket package approach, Famers group approach, and so on to address the need (Dhital 2017). Recently, Nepal's government has formulated the constitution of Nepal 2072 which has granted agriculture service delivery within the local government. It streamlined the new administrative structures of Nepal and agriculture service delivery through local government to be more effective [10,11].

The recent literature [12,13,14,15,16] on agriculture services delivery majorly focuses on the effectiveness and perception of new institutional arraignment toward service delivery. However, very few studies discuss the interaction and interrelationship between the actors (stakeholders) and their overall influence on the system [3,17]. However, relations and inter-relationships between the stakeholders in the complex and diverse system are complex to measure. The framework proposed by Birner et al (Birner et al. 2019) and traditional assessment methods/approach didn't fully capture the dynamics around the actors (stakeholders) involved in the system.

Social network analysis focuses on the social interaction between network stakeholders. It deals with the interaction of nodes (actors), their relation, the information flow within a network, and its overall impact on the network(Misra et al. 2014). Social network analysis enables us to understand multidimensionality, resource mobilization, information dissemination, and stakeholder interaction (Parthasarathy 2012).

Stakeholders with a high-status virtue in the network play an important role in disseminating existing and new knowledge and skills in their network(21,22). They act as change agents or mediators for the information flow between different clusters within a network. Those that hold

the majority of the connection are very few (Bourne et al. 2017) and need to be identified and incorporated for the better facilitation of information within a network (Wood et al. 2014).

Stakeholders within a core position that can influence the whole network can be identified in many ways. The betweenness centrality measure of the social network analysis is one of the many ways to identify stakeholders that are much more critical for the flow of information. Skaalsveen et al (Skaalsveen, Ingram, and Urquhart 2020a) advocate the intermediaries/mediators identified by the service recipient i.e., in the farmer's network were particularly important in the information sharing and innovation diffusion approach.

The paper first describes the perception of service recipients on the current public EAS delivered by the local government in each respective municipality. Then it will identify the strong mediators involved in the EAS in each municipality and its information flow pattern through social network analysis.

Objectives

To explore and identify the stakeholders involved in extension and advisory services diffusion patterns and their influence on the overall perception of EAS services at the municipal level.

1. To identify and compare the perception of service recipients on extension and advisory services at the municipal level
2. To explore stakeholders involved in extension and advisory services diffusion pattern at the municipal level

Limitations of the study

The research was conducted only in the two municipalities i.e., Chandragiri and Dakshinkali municipality. Although, the public service delivery modality is the same all over the country. The players in the public service delivery of EAS are the same but the other stakeholders involved in the service delivery of EAS may be different. So, the research mayn't involve all the prevalent stakeholders at the municipal level all over Nepal. Secondly, this research seeks the relationship between the stakeholders but does not consider the relationship (direction of relationship) between them.

2. Materials and Methods

The research question demands a view of the perception and flow of extension and advisory services through objective and subjective lenses. A convergent parallel mixed-method research design (25, 26, 27) was employed to understand the perceived perception of public extension and advisory services and the strong mediators involved in the flow of EAS services at the EAS network.

The conceptual framework of the study is presented in Figure 1.

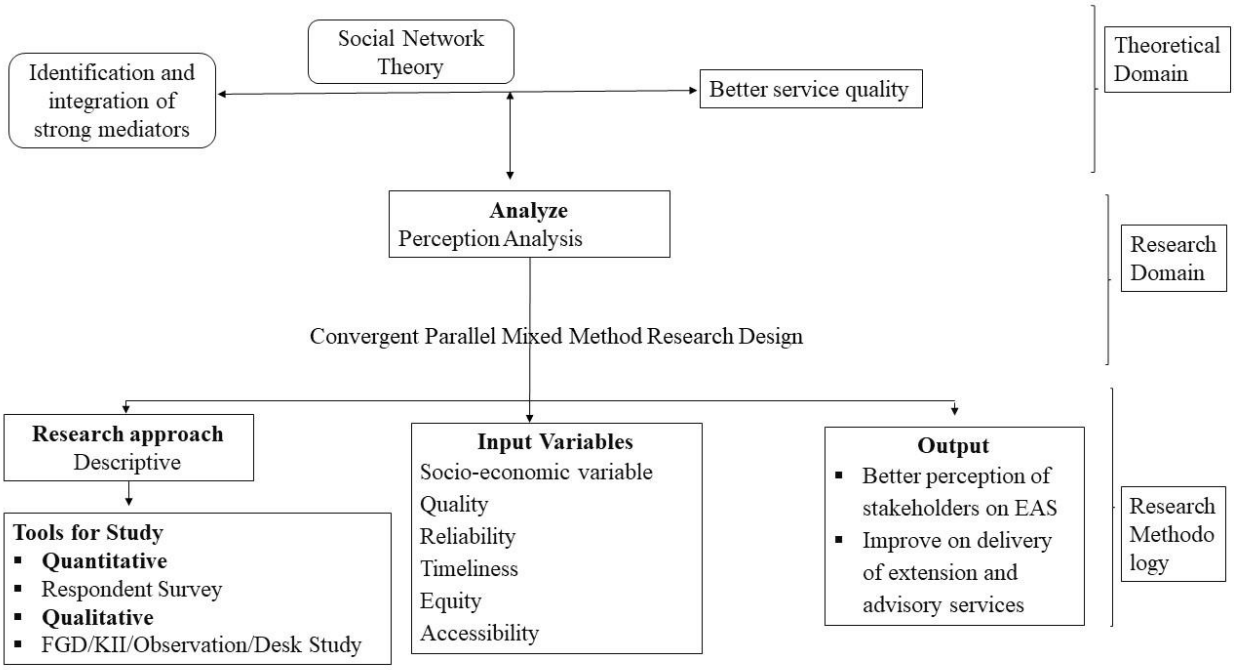

Figure 1: Conceptual framework of the study related to extension and advisory services at the municipal level , 2023

Figure 1. Conceptual framework of the study

2.1 Study site

The research domain was service recipients in the Kathmandu district. Chandragiri and Dakshinkali municipalities were selected randomly from 11 municipalities. It is illustrated in **Figure 2**.

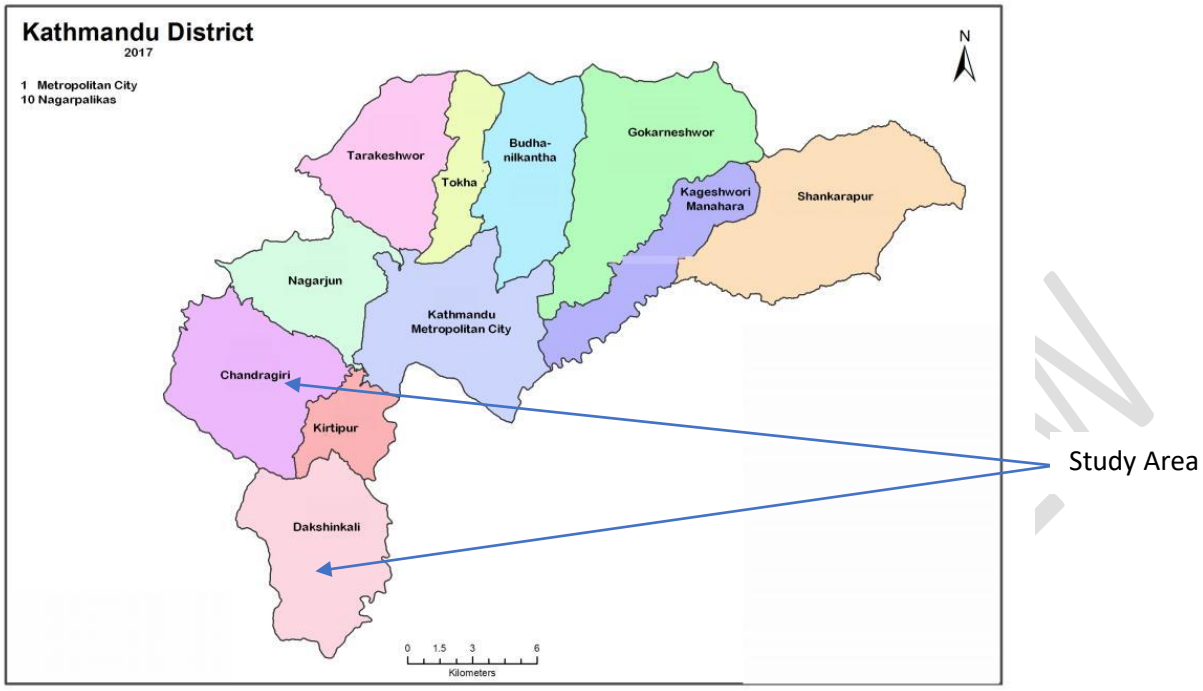

Figure 2. Study map of the research site, 2023

2.2 Data collection strategy, sample size, and sampling techniques

Samples were taken using simple random and purposive sampling techniques for all the related agriculture extension and advisory services delivery stakeholders. The field survey (respondent format), focus group discussion (FGD), and key informant interview (KII) were the major tool for prime sources of data. Whereas, secondary literature was used as a source of secondary data information. The study's minimum sample size was calculated using Yamane's formula for quantitative data collection. The sample size was calculated for the known population size as explained by Uakarn et al(Uakarn, Kajohnsak, and Sintao 2021).

$$\text{Yamane's forman} = \frac{N}{1+N\,(e)^2}$$

Where,

n is the required sample size

N is the size of the population

e is the level of precision or sampling of error which is ±5%

The sample size was calculated to be 196 from the total sampling frame of the study location in the case of service recipients (farmers). 100 service recipients from each municipality were taken for the study by using a random sampling method. Apart from that, 22 KII were conducted (11 from each municipality) and 4 focus group discussions (2 from each municipality) were conducted as presented in Table 1. The data was collected only after the verbal consent was given by the participant in the study.

Table 1. Data collection strategy at the study site, 2023

Data collection strategy	PR	EO	SA	AO	IS	INGOs/NGOs	Farmers	Total
Survey							200	200
KII	6	4	2	2	2	2	4	22
FGD				2			2	4

Quantitative data was collected through face to face interviews using a semi-structured respondent format as explained by (Mahat-Shamir, Neimeyer, and Pitcho-Prelorentzos 2021; Taherdoost 2016). Qualitative data was collected by using a focus group discussion and key informant interview as explained by (O.Nyumba et al. 2018; Veldhuijzen et al. 2007).

2.3 Research instrument and scale

After the construct was developed on the Likert scale, face, content and criterion validatity were conductedz. An expert panel of IAAS and extension organization specialists will be selected to ensure face and content validity.

For face validation, constructs were submitted to the expert panel of IAAS. For the content validation, the construct was submitted to the subject matter specialist related to extension and advisory services as explained by explained by (Heale and Twycross 2015), the construct with a value greater than 2 was selected for the final questionnaire. Then the questionnaire was subjected to pretesting i.e., 10% of the sample from the sample frame was selected for the pilot testing and a reliability test was carried out to check internal consistency and reliability. The construct having a Cronbach value above 0.7** was selected for the study (Bonett and Wright 2015; Lam and Woo 1997). The Cronbach value is found to be 0.9 as presented in Table 2.

Table 2. Reliability test of the questionnaire items

Item	Initial items	Final items	Cronbach alpha
Perception of extension and advisory services	18	13	0.9

Afterward, the criterion validity was conducted based on the correlation coefficient value and significant p-value (2-sided) at a 1% level of significance, the construct with p-value less than 0.01 was selected for further study.

2.4 Data Analysis

After the data collection, the data was subjected to analysis. The collected data and information were first entered into MS Excel and analyzed using various statistical packages like MS Excel and SPSS version 26 and R Studio (version 1.4.1717). A convergent mixed method analysis was

followed. The side-by-side comparison approach was majorly used in my research i.e., reporting the quantitative statistical result first and then interpreting the qualitative result to either support or reject the quantitative statistical result (Creswell and Creswell 2018).

Descriptive statistics (Mean), Likert scale graph, Social network analysis, and community network map were used to explore the perception of extension and advisory services along with stakeholders involved in the EAS diffusion pattern at the municipal level.

Likert Scale:

A five-point Likert scale was used to assess the perception of service recipients on current public extension and advisory services. The score from 1-5 was given as follows:

1: Very Dis-satisfied, 2: Dis-satisfied, 3: Neutral, 4: Satisfied, 5: Very Dis-satisfied

Social Network Analysis:

Yousefi Nooraie et al., (37) advocate that social network analysis was conducted to investigate the social interaction between stakeholders both quantitively and qualitatively. SNA deals with the interaction of nodes (actors), the relation between them, and their whole impact on the network (Bloch, Jackson, and Tebaldi 2023; Fronzetti Colladon and Naldi 2020). Various literature suggests that Social network analysis is gaining popularity in agriculture i.e., to examine the dynamics (influence and power) revolving around them (Y. Li et al. 2013), and to examine the information flow pattern of extension and advisory services (de Roo et al. 2023). So, in my research, I used social network analysis to find the influence of each stakeholder on the network. Within a network (Das, Samanta, and Pal 2018; H. Li 2018; Zhang and Luo 2017a), it is argued that those that have high betweenness and eigenvector centrality are the most influential within a network.

Information provided by the respondents was coded to form an adjacency matrix to show the presence or absence of a unidirectional relationship between them. Social network analysis was then conducted by using R- studio (Version 1.4.1717) along with the calculation of betweenness centrality among the stakeholders in the EAS network by using the following formula;

Betweenness centrality:
The betweenness centrality measure of the social network analysis is one of the many ways to identify stakeholders that are much more critical for the flow of information. Betweenness centrality measures the shortest path between the nodes based on the probability of occurring **(41, 42)** . Those that have a high probability will have a high betweenness centrality(Boston and Kadushin 2004; Dunn 1983), thereby influencing a whole network for the dissemination of information flow. It is calculated by using following formula;

$$c_B(n_i) = \sum_{j<k} g_{jk}(n_i)/g_{jk}$$

$C_{B\,(n_i)}$= Betweness centrality of i^{th} node
$G_{jk}(n_{i)=}$Number of shortest path from node j to node k
$G_{jk\,=}$ Number of that path that passes through node j and node k

Community Network Map

Bohlin et.al (Bohlin et al. 2014) argued that the community within a social network is represented in a close circle. The community within a node is densely connected internally. As

nodes (stakeholders) are connected closely, the services seem to flow seemingly and service recipients perceive the services more positively.

Operational definition:

Perception:

It is the people's attitude toward the present public agricultural extension and advisory services.

Network: It is the group of institutions, actors, and stakeholders involved in certain activities to fulfill the common goal.

Social Actor: Those Individuals in a position to influence the network for a particular activity previously but now not in power e.g. Previously elected political representatives, Chairman of civil society

Progressive Farmers: Farmers that are close to the other farmers and hold the position of opinion leaders in the flow of agricultural services

Political representatives: The newly elected personnel at the local level/municipal level to run local governance

Agriculture Section: It is the unit of local government that focuses on the agriculture sector of the local areas.

Farmers group: The number of people associated with agriculture gathered to form an organization to achieve a common goal

Others: These are the organization that operate within a study area for extension and advisory services delivery, but are under the realm of provincial and central government institutions. These include PMAMP and the Agriculture Knowledge Center.

Input Suppliers: These are the stakeholders that were concerned with the delivery and supply of agriculture input like seed, fertilizer, bio-fertilizer, agro-machinery, etc. i.e., agro-vet and Muktinath Krishi Company Limited, and so on.

Administrative Officer: The chief of administrative government staff at the local level.

3. Results and Discussion

3.1 Socio-demographic characteristics of respondents

The socio-demographic information of respondents in the study area is presented in Table 3.

Table 3. Socio-demographic information of respondents in the study area, 2023

Variable name		Frequency	Percentage
a. Gender			
	Man	89	44.5
	Women	111	55.5
b. Age of service recipient by economic activity			
	Economically active	193	97
	Economically inactive	6	3
c. Level of Education			
	Illiterate	22	11
	Primary	57	28.5
	Secondary	72	36
	High School	30	15
	Graduate	13	6.5
	Master	6	3
d. Family size of service recipients			
	Small (<4)	38	19
	Medium (4-7)	148	74
	Large (>7)	14	7
e. Head of Household Head			
	Yes	134	67
	No	66	33
f. Minimum Distance to access the agriculture service from Local Government			
	0-2km	94	47
	2-4 km	90	45
	4-6 km	13	6.5
	>6 km	3	1.5

g. Type of service receiver by landholding size		
Landless or Nearly Landless (<10 ropani)	178	89
Subsistence (10-20 ropani)	17	8.5
Samll commercial (<20 ropani)	7	3.5

The results show that most service recipients were from female households occupying 55.5% of the total respondents. This indicates the increased feminization in agriculture due to the migrated labor force in the foreign country (Tamang, Paudel, and Shrestha 2014; Upreti et al. 2018). The findings of education level revealed that 89% of the respondents have a primary level of education or higher than that which represents the capability to read and write. The FGD/KII revealed that the literacy rate was high as the sample area was located in Kathmandu districts' urban and peri-urban sides. The finding revealed that most of the respondents have a medium-sized family scale (74%), less than 10 ropani landholding size (89%), and are located within the periphery of 4km (92%) of the official surroundings that deliver the agriculture extension and advisory services.

3.2 Perception of service recipient on extension and advisory services

3.2.1 Perception of service recipient on extension and advisory services at Chandragiri Municipality

Table 4. Perception of service recipient related to extension and advisory services at Chandragiri municipality, 2023

Statement	Mean	SD
Renders high-quality extension and advisory services	2.69	0.906
Render demand-driven extension and advisory services	2.53	0.881
Render flexible extension and advisory services in responding to farmers' ever-changing needs	2.66	0.878
Facilitates accessibility and affordability of new technologies to relevant stakeholders	2.49	0.926
Facilitates accessibility in the planning and decision-making process	2.68	0.930
Promotes inclusiveness and equity while delivering a service to farmers	2.51	0.989
Is local government (Agriculture development section) the best service provider in your locality compared to others? (Yes/No)	2.51	0.948
How do you rate the overall performance of the municipality's agriculture development section?	2.34	0.912

How timely does the agriculture development section provide agriculture service?	2.35	0.93
How timely did the agriculture officer respond to the problems encountered in your agriculture sector?	2.23	0.96
Did extension workers notice, identify problems, and respond to them independently?	2.33	0.97
Did ADS/extension workers give information/alerts about upcoming serious problems in agriculture?	2.43	0.98
Did ADS provide the information, notice, and upcoming agriculture-related activities (Extension and advisory services)?	2.45	1.06

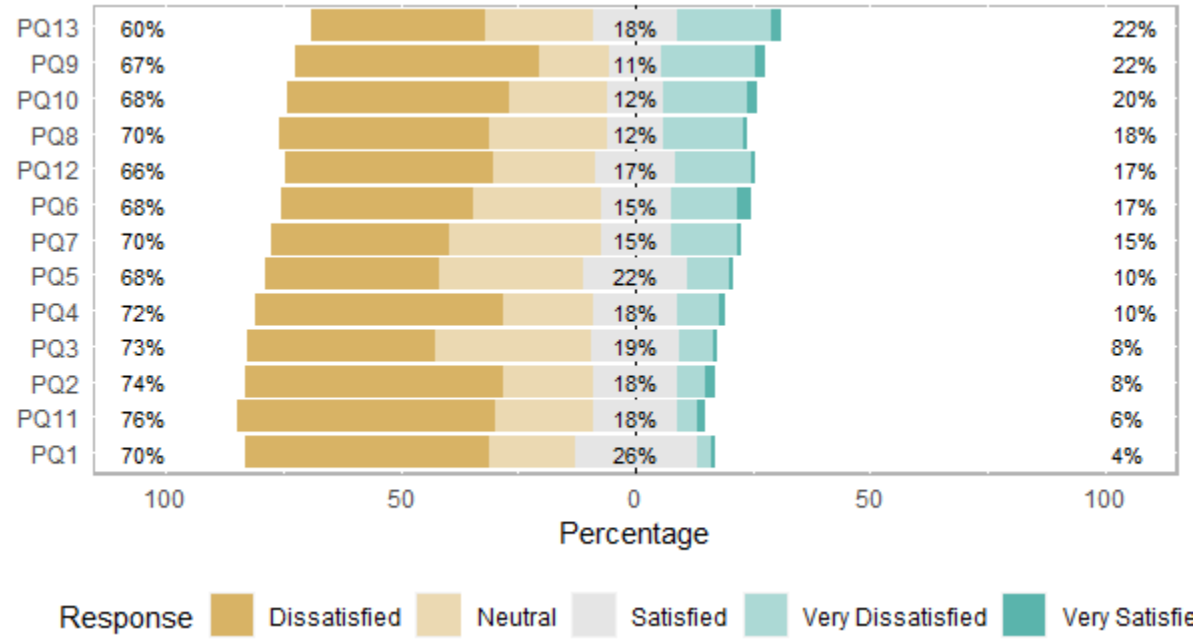

Figure 3. Frequency response of service recipient related to extension and advisory services at Chandragiri municipality, 2023

Statements were taken on a Likert 5-point scale from highly dissatisfied to highly satisfied at a scale of 1-5.

A total of 13 statements were taken to measure the perception of farmers toward present public EAS from the service recipient's perspective as presented in Table 4. While looking at the Chandragiri municipality, the service recipient of the Chandragiri municipality perceives the construct negatively (mean score<2.5) toward the present public extension and advisory system. Similarly, while looking at the frequency response Likert scale graph (Figure 3), the frequency is skewed toward the negative side than that of the positive side. This shows that the people of Chandragiri municipality perceive the public EAS not so positively as we expected after the decentralization of EAS at the local level in 2015. Research conducted by Karki et al., (2018) in

Lamjung, Nepal presented a similar viewpoint. The KII and FGD revealed that the municipality declared itself as having non-agriculture land according to the Land Use Act, 2076, and Land Use Regulation 2079. It results in less prioritization and budget allocation in the agriculture sector (public extension and advisory services), as only 0.96% of the municipality budget is allocated. Poor allocation of resources and poor prioritization of the agriculture sector by local government contributed to the poor perception of public EAS (Jaishi et al. 2023)**.**

Social network analysis (mediators for the flow of current public EAS) and the community network map of Chandragiri municipality further explains the poor perception of public EAS at Chandragiri municipality.

3.2.2 Social Network Analysis of Chandragiri Municipality

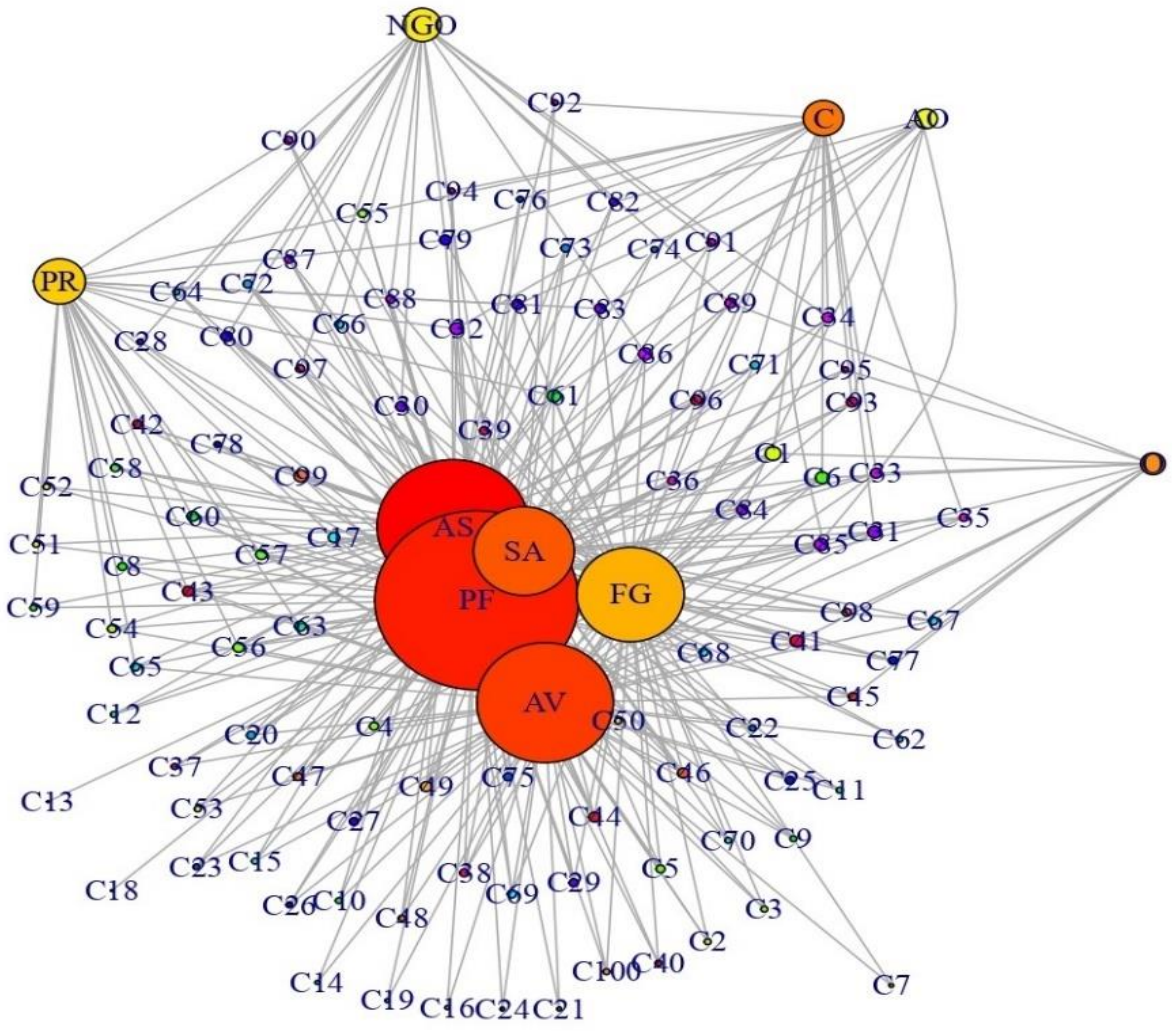

Figure 4. Stakeholders involved in agriculture extension and advisory services at the Chandragiri municipality of Kathmandu, 2023

Table 5. Stakeholders in the EAS network with associated betweenness centrality at the Chandragiri municipality, 2023

S.N.	Stakeholders	Betweenness Centrality
1	Progressive farmers	2384.94
2	Agriculture Section	1134.8
3	Input Suppliers	855.21
4	Farmers group	511.7
5	Social Actor	452.85
6	Political Representatives	95.77
7	Co-operatives	72.74
8	NGOs/INGOs	62.67
9	Others	19.51
10	Administrative officer	14.77

Betweenness centrality in the SNA quantifies the number of times stakeholders act as mediators along the shortest possible path between other stakeholders in the network(Zhang and Luo 2017a). Stakeholders with a high probability of being mediators on the chosen shortest path have high betweenness centrality in the flow of information in the network(Boston and Kadushin 2004; Dunn 1983).

Those that have higher betweenness centrality (Figure 4 & Table 5) act as a mediator for the flow of information from one node to another (H. Li 2018; Zhang and Luo 2017b). From above Progressive farmers had the highest betweenness centrality (2384.94) followed by the agriculture section (C_B= 1134.8), input suppliers (C_B= 855.21), farmers groups, Social actors, etc. It means the progressive farmers, agriculture section, input suppliers, farmer group, and social actors act as mediators for flowing the extension and advisory services to farmers at the local level from the service recipients' point of view. Several studies showed that progressive farmers act as opinion leaders, have in-hand experience/knowledge, and adopt interpersonal communication methods (Sligo and Massey 2007; Sligo, Massey, and Lewis 2005; Wick et al. 2021) with their fellow farmers making them more important mediators in EAS networks (Skaalsveen, Ingram, and Urquhart 2020a; Wick et al. 2021). Progressive farmers are eager to communicate with each other and with their fellow farmers, as they believe in acquiring valid, trusted, tactical information embedded with practice (Skaalsveen, Ingram, and Urquhart 2020a) making them important mediators in the network (Skaalsveen, Ingram, and Urquhart 2020b). Poncet et al., (Poncet, Kuper, and Chiche 2010) recommend integrating progressive farmers in sustaining agriculture extension network to facilitate an information and interaction within a network.

The KII and FGD revealed that the political representatives and agriculture section believe themselves as a strong mediators in the EAS service flow. But from the SNA, the political representatives have a lower betweenness centrality (504.44). It means that the majority of the stakeholders involved in EAS at the local level didn't see political representatives as a mediator while flowing the agriculture extension and advisory services. This contradicts the way public

EAS flows in the present context vs the majority of the stakeholders that view the EAS flow through them in the Chandragiri municipality. These result in a poor perception of public extension and advisory services as seen from the Table 5 and Figure 4 above.

3.2.3 Community network map of Chandragiri Municipality

The community network map of the Chandragiri municipality (Figure 5) further illustrates the poor perception of public extension and advisory services to farmers. Bohlin et al., (Bohlin et al. 2014) argued that the community within a network is represented in a close circle. The community within a node is densely connected internally. As nodes (stakeholders) are connected closely with each other, the services seem to flow seemingly and service recipients perceive the services more positively. From the figure below, it seems that some of the service recipients are outside of the circle within a network, and are loosely connected to the EAS network. Those that are outside of the circle feel more distant from the community and far from reach to gain the services. This may result in the poor perception of the public EAS services at the Chandragiri municipality.

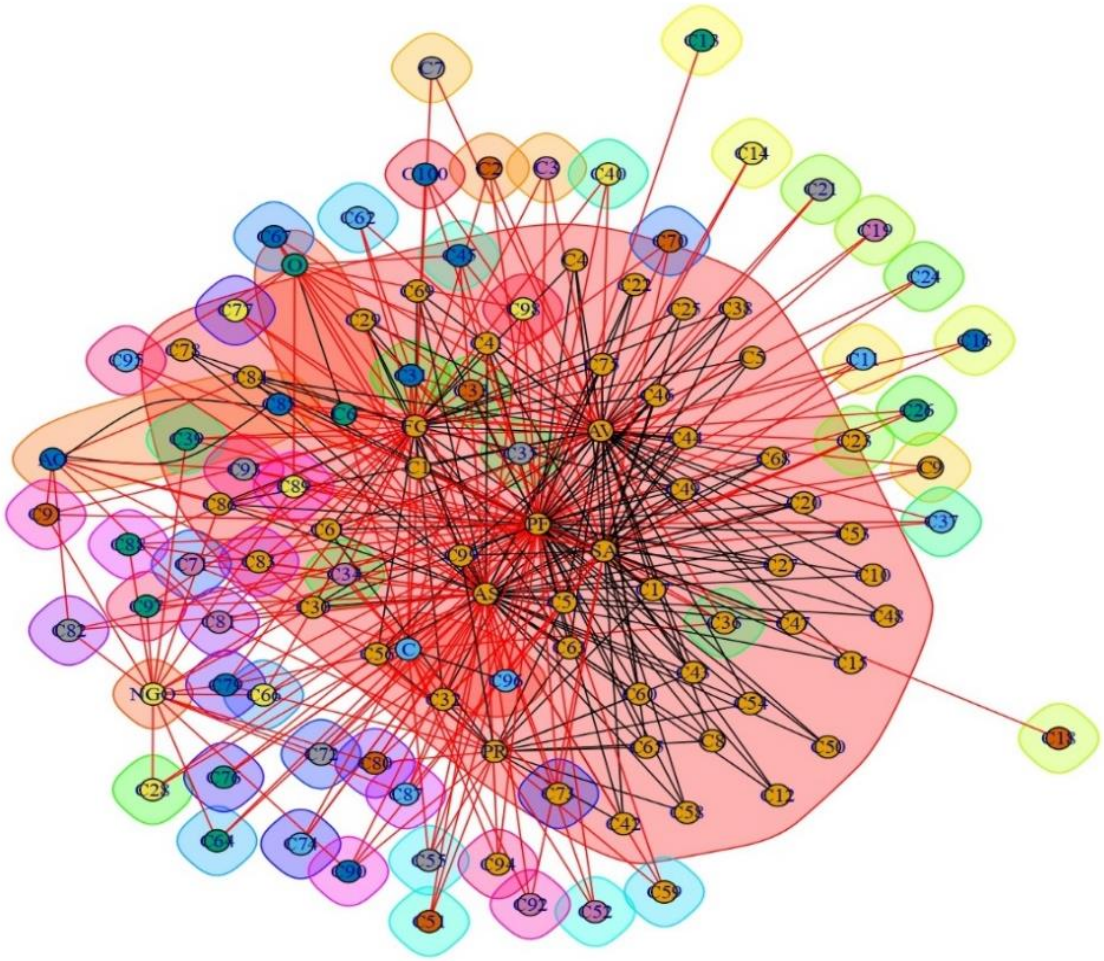

Figure 5. Community network map of EAS stakeholders in Chandragiri municipality, 2023

3.2.4 Perception of service recipient on extension and advisory services at Dakshinkali Municipality

Service recipients' perceptions toward extension and advisory service delivery were analyzed from 13 statements (Table 6) using a 5-point Likert scale from highly disagree to highly agree.

Table 6. Perception of service recipients on extension and advisory services at Dakshinkali municipality

Statement	Mean	SD
Renders high-quality extension and advisory services	3.08	0.98
Render demand-driven extension and advisory services	2.97	0.961
Render flexible extension and advisory services in responding to farmers' ever-changing needs	3.02	0.934
Facilitates accessibility and affordability of new technologies to relevant stakeholders	2.975	1.077
Facilitates accessibility in the planning and decision-making process	3.065	0.98
Promotes inclusiveness and equity while delivering a service to farmers	2.92	1.06
Is local government (Agriculture development section) the best service provider in your locality compared to others?	2.95	1.02
How do you rate the overall performance of the agriculture development section of the municipality?	2.85	1.1
How timely does the agriculture development section provide agriculture service?	3.4	0.99
How timely did the agriculture officer respond to the problems encountered in your agriculture sector?	3.41	1.09
Did extension workers notice, identify problems, and respond to them independently?	2.55	1.05
Did ADS/extension workers give information/alerts about upcoming serious problems in agriculture?	2.73	1.05
Did ADS provide the information, notice, and upcoming agriculture-related activities (Extension and advisory services)?	3.35	0.92

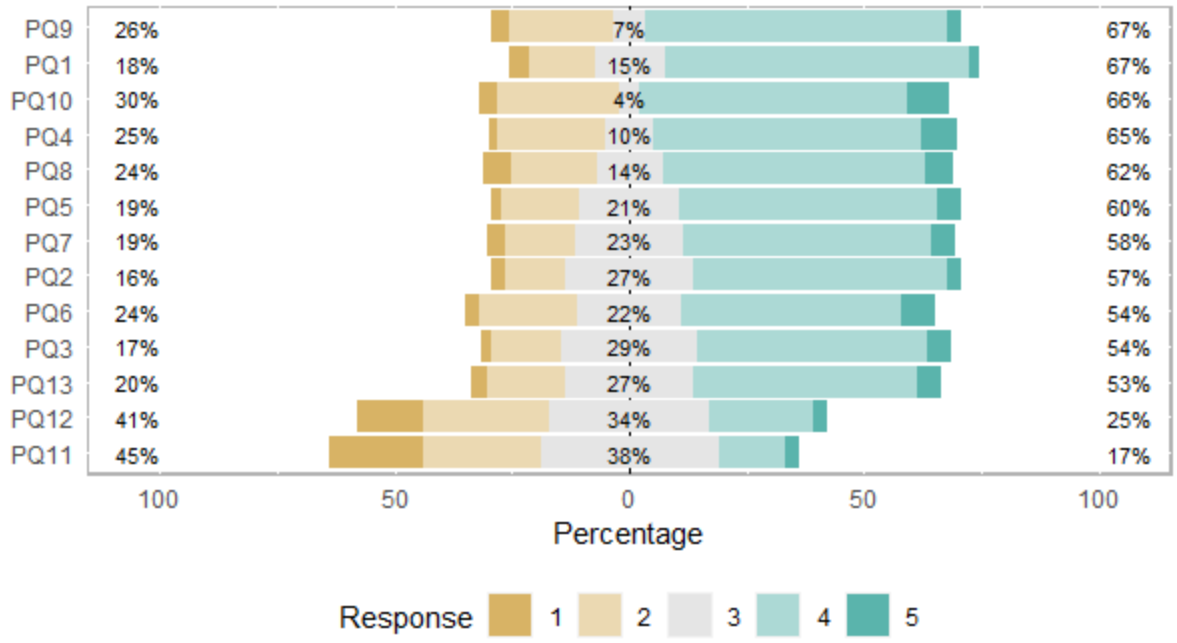

Figure 6. Frequency response graph of service recipients on public extension and advisory services at the study area at dakshinkali municipality, 2023

While looking at the Dakshinkali municipality, the service recipient of the city perceives the 10 constructs positively toward the present public extension and advisory system (mean score>2.5). Whereas, in the official push constructs and overall performance of the agriculture development section service recipients rated slightly negative responses. Similarly, while looking at the frequency response Likert scale graph (Figure 6), the frequency is skewed toward the positive side except for constructs 12 and 13. Overall, the farmers perceive the public extension and advisory services positively in the Dakshinkali municipality than that of Chandragiri municipality. The KII and FGD revealed that the Dakshinkali municipality declared itself as having agricultural land (more than 40%) according to the Land Use Act, 2076, and Land Use Regulation 2079 and had allocated a higher portion of the budget (1.62%) to agriculture than that of Chandragiri municipality (0.96%). However, the portion of budget allocation is very much less than those in other sectors.

3.2.5 Social Network Analysis at Dakshinkali Municipality

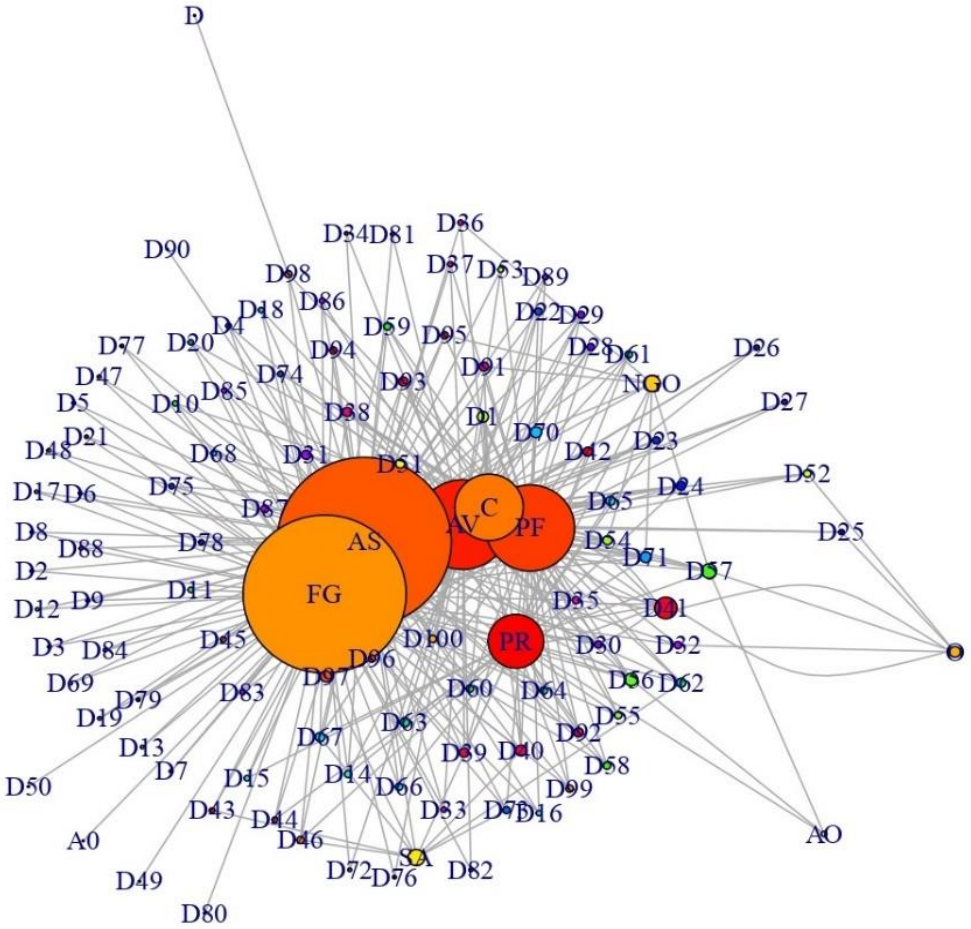

Figure 7. Stakeholders involved in agriculture extension and advisory services at the Dakshinkali municipality of Kathmandu, 2023

Table 7. Stakeholders in the EAS network with associated eigenvector centrality at the Dakshinkali municipality, 2023

S.N.	Stakeholders	Betweenness Centrality
1	Agriculture Section	2292
2	Farmers Group	2199.57
3	Input Suppliers	584.32
4	Progressive Farmers	481.91
5	Co-operatives	280.67
6	Political Representatives	162.85
7	NGOs/INGOs	10.4
8	Social Actors	8.45
9	Others	4.54
10	Administrative Officer	0.196

In the Dakshinkali municipality, the agriculture section had the highest betweenness centrality (Figure 7 & Table 7) followed by the farmer's group, progressive farmers, input suppliers, and so on. It means the progressive farmers, agriculture section, input suppliers, farmer group, and social actors act as mediators for flowing the extension and advisory services to farmers at the local level from the service recipients' view. In Dakshinkali municipality, the political representatives who claim themselves as strong mediator are found to be somewhat moderate mediators in public EAS services. The political representatives of the local level have higher betweenness centrality than that of Chandragiri municipality. This explains that the government entity bound to provide the public extension and advisory sector are seen as mediators while delivering public EAS services as the public EAS flow majorly. This contributed to the better perception of public EAS services provided by the government of Dakshinkali Municipality.

3.2.6 Community Network Map of Dakshinkali Municipality

In the case of Dakshinkali municipality, the nodes within a network are densely connected inside the circle (Figure 8). It seems that all the stakeholders are fall within a network and inside a closed circle. The community network map of Dakshinkali municipality shows that they are densely connected and feel close to each other. This results in a better perception of current and public EAS within a network.

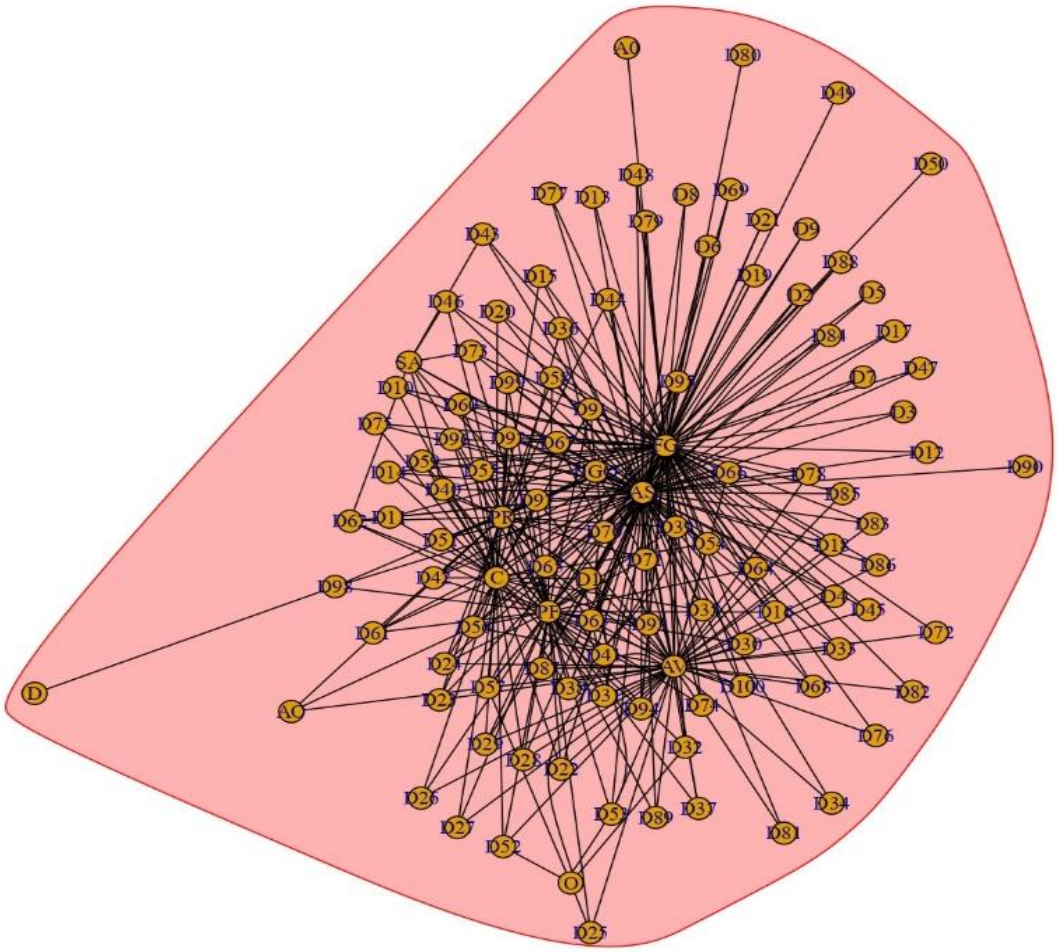

Figure 8. Community network map of EAS stakeholders involved in Dakshinkali municipality, 2023

Conclusion

The government of Nepal has introduced the concept of decentralization through federalism to devolve the power and authority from the central level to the local level of government. The constitution of Nepal has decentralized the agriculture service delivery (extension and advisory services) within the realm of local government aiming to ensure efficiency, transparency, and accountability. The service receiver's expectation from the local government on public extension and advisory services is higher, but delivery and flow of extension and advisory services is still an issue.

The research serves to identify the stakeholders involved in the public extension and advisory services at the local level. The Dakshin Kali municipality and Chandragiri municipality were selected purposively for the study. The sample size was calculated to be 200 (random sampling strategy for the selection of registered farmers and purposive sampling strategy for the other stakeholders). A convergent parallel mixed method research design was used employing both quantitative (survey) and qualitative methods (KII, FGD). For the quantitative method, the questionnaire was prepared and subjected for the reliability and validity test. The reliability test was done by using Cronbach alpha and as an average, a 0.88* was obtained, which was acceptable. The validity test was done by using face validity and content validity (construct that are above the score 2 are retained), and concurrent validity (by using SPSS) techniques.

The primary data was gathered from stakeholders of agriculture service (extension and advisory service) at various local levels. On the other hand, secondary data was sourced from online materials, diverse articles, reports, journals, and books, as well as published materials from municipalities and rural municipalities. After data collection, the questionnaire was coded, entered in the Excel, and analyzed by using Statistical Package for Social Science (SPSS Ver. 16.) and R studio (Version 1.4.1717). From that, descriptive statistics, social network analysis, and inferential statistics were used to analyze the data. Furthermore, FGD and KII were used to triangulate the data and for further verification.

The paper concludes that despite the poor perception of advisory services regarding quality, equity, accessibility, and flexibility of the EAS services, the services were provided promptly in Chandragiri municipality. The declaration of non-agricultural land, lower prioritization and allocation of budgets, and dispersed stakeholders (loosely connected) in the EAS network contributed to the lower perception of the current public EAS at the Chandragiri municipality. The service recipients of the Chandragiri municipality perceive progressive farmers, and input suppliers (apart from the agriculture section) as their major mediators in the flow of the EAS services at the EAS network. The current flow of public EAS includes political representatives, the agriculture section, and farmers' groups as their mediators, but the service recipients didn’t consider them as important mediators in the information flow of EAS. This contributed to the poor perception of public extension and advisory services constructs.

In Dakshinkali municipality, the perception of public EAS is slightly positive in the majority of the construct. The declaration of agricultural land, prioritization and allocation of budgets on

agriculture than Chandragiri municipality, and densely connected stakeholders in the EAS network contributed to a better perception of the current public EAS at the Dakshinkali municipality than Chandragiri municipality. The EAS network of the Dakshinkali municipality perceives the agriculture section, farmers group, and progressive farmers as their important mediators for the flow of EAS services. The delivery of current public EAS to the service recipients through certain stakeholders is somewhat matched with the view of the EAS network at the Dakshinkali municipality. This contributed to the better perception of the EAS construct of the Dakshinkali municipality.

The research concludes that, in both cases, the EAS network viewed input suppliers (agro-vet, seed, machinery suppliers) and progressive farmers as their strong mediators for the flow of extension and advisory services. This demands for the identification and recognition of the important mediators in the EAS at the local level and then integration into the EAS delivery to the EAS network to be more effective and efficient.

Ethical Approval:

The study was conducted from November 2022 to April 2023. The ethical approval was taken on 20 October 2022 from the research committee of Directorate of Research and Publication of the Institute of Agriculture and Animal Sciences, Kirtipur, Kathmandu, Nepal.

Consent

As per international standards or university standards, Participants' written consent has been collected and preserved by the author(s).

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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Details of the AI usage are given below:

1.

2.

3.

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Appendix A

SUPPORTING INFORMATION

S1. RESPONDENT FORMAT

STAKEHOLDER ANALYSIS OF AGRICULTURAL EXTENSION AND ADVISORY SERVICES AT THE LOCAL LEVEL IN FEDERAL NEPAL

Namaste! I am the Author of this Manuscript. The research is a part of my M.Sc. in Agricultural Extension and is purely academic research. I request your valuable time to respond to some questions. These constructs are used only to know stakeholders involved in extension and advisory services at the Local Level in the Present Context of the Federal Governance System. Answers and information, you provide will remain strictly confidential within me and my institute and used only for academic purposes. I thank you in advance for your valuable time and contribution. Do you agree?

General Information:

Variables to addressed: (Gender Age Education Household Head Family Size Type of farming Land Holding Size Occupation)

A. Basic/Household Information

1. Name of respondent:
2. Gender: Men ☐ women ☐ 3. Address:
4. Age . . . Years 5. Is this the farmer's head of the household? A. Yes B. No
6. Family size _____ 7. Family size fully/partially engaged in agriculture ……
8. Education of HH: (1-illiterate 2- Primary 3-Secondary 4-High School 5-Graduate 6- Master)
9. Occupation:

A. Agriculture B. Business C. Wage/Labor D. Government Service

9. Family size fully/partially engaged in agriculture

A. Male …… B. Female…..

10. Minimum distance to access agriculture service of LG……
11. How many years of education have you completed? _____ years
12. How many years have you farmed in this area? _____ years
13. Landholding size:……. (A- Landless or Nearly landless (<0.5 ha) B- Subsistence (0.5-1 ha) C- Small Commercial (1-5 ha))
14. Type of Respondent:

A. Farmers/Agri-entrepreneur B. Extension Workers

C. Local representatives D. Service Provider

B. Land Ownership Details

Land Ownership: A. Own B. Lease C. Rent D. Others

Area (Ropani):

Color of Land Ownership:

A. Red B. Green C. White

Income:

S.N.	Particulars	NRs
1	Agriculture	

2	Business
3	Wage/labor
4	Government Service
	Total

Housing Type: A. Concrete B. Kacchi Ghar

A. Social Network Analysis

1. Name:

2. Title/position:

3. From whom do you receive/give agriculture/extension services?

A. Political representatives
B. Agriculture officer
C. Co-operatives
D. Farmers
E. Social Actors
F. Agrovet
G. Others (The stakeholder will be placed based on findings from research question 1)

4. Who do you think

4. How often do you interact with the related agriculture stakeholders (Political representatives, Agriculture officer, Co-operatives, Base level Farmers, progressive farmers, Social Actors, Input deliveries (Agro-vet, Muktinath agri-company limited), Others (PMAMP/AKC)) related to extension and advisory services?

Daily/Weekly/Monthly/Quarterly/Annually/Rarely/Never

5. What types of communication channels do you use to interact with other stakeholders? (Select all that apply)

Face-to-face meetings/Phone calls/Emails/Text messages/Social media/Other (please specify)

6. How would you rate the quality of your interactions with other stakeholders related to extension and advisory services?

Excellent/Good/Fair/Poor/Very poor

7. In your opinion, which of the following types of interactions are the most important for achieving your goals related to agriculture and extension services? (Rank in order of importance, with 1 being the most important and 5 being the least important)

A. Information Sharing B. Collaboration on projects or initiatives
C. Seeking advice or guidance D. Advocacy or lobbying

8. To what extent do you collaborate with other stakeholders in the agriculture sector?

9. How much influence do you have on decision-making related to agriculture and extension services?

Knowledge gap

1. How familiar are you with the concept of agricultural extension and advisory services?
   A. Very familiar
   B. Moderately familiar
   C. Somewhat familiar
   D. Not familiar
   E. Not heard at all

2. What do you mean by extension and advisory services in agriculture services?
3. How familiar are you with the various types of agricultural extension and advisory services?
   A. Very familiar
   B. Moderately familiar
   C. Somewhat familiar
   D. Not familiar
   E. Not heard at all
4. Do you know the current extension and advisory services that are prevalent to farmers?
5. Are you updated with the new and emerging extension and advisory services?
6. To what extent do you consult with others while delivering extension and advisory services?
7. Are agricultural extension and advisory services important to farmers?
   A. Very important
   B. Important
   C. Moderately important
   D. Somewhat important
   E. Not important
8. How effective are current extension and advisory services for improving farmers' livelihood?
   A. Very effective
   B. Effective
   C. Moderately effective
   D. Somewhat effective
   E. Not effective
9. Is there anything that you would like to add about your experience with agricultural extension and advisory services?
10. What are your suggestions regarding the improvement in the delivery of extension and advisory services?