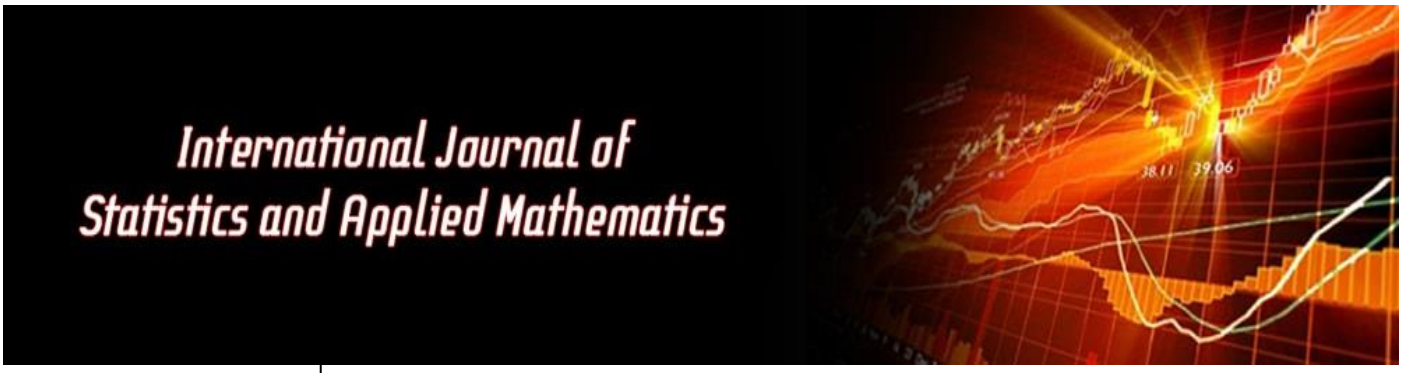

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Identifying social networks among the women vegetable growers in cultivation and marketing

Janaki Rani A, Sangavi M and Murugan PP

Abstract
Vegetables are the important constituents of Indian horticulture and nutritional security due to their short duration, high yield, nutritional richness, economic viability and ability to generate on-farm and off-farm employment. Even though the vegetable production is high, the farmers are struggling a lot to come up well to meet out the demand of growing population. One of the reasons is non-adoption of recommended scientific practices in which improper communication network among the farmers in seeking and sharing the information. In this connection, Social Network Analysis was worked out to assess the internal networks from vegetable cultivation to marketing by using UCINET 6 software. With regard to communication network among farmers, the highest in degree centrality score for getting seeds/seedlings was Agri-depots (39) followed by friends and relatives (33). With regard to inclosenesss centrality, the high score was progressive farmer (254) and private nursery (210). The high score on in closeness centrality for fertilizer purchase was co-operative society and agri depots (175) followed by private consultancy (172) and progressive farmer farms (170). The in closeness centrality for getting fertilizer were fertilizer shop (163). The highest in degree centrality score on plant protection was pesticide shop (54). The maximum between ness score for marketing was 3470.9 which indicated the source on whole saler/retailer. Only 5-7% of the information is shared among the farmers. The farmers identified for sharing in the network system which will be used as a channel for sharing the information related to agriculture and horticulture.

Keywords: Internal networks of vegetable growers, Social Network Analysis, centrality measures of the network, channel for communication and UCINET 6

Introduction
Vegetables are the important constituents of Indian horticulture and nutritional security due to their short duration, high yield, nutritional richness, economic viability and ability to generate on-farm and off-farm employment. Among the vegetables, tomato has the largest vegetable area and consuming crop in the world and known as ‘protective food’ on account of its peculiar nutritive worth and furthermore its wide spread creation. Even though production and productivity of vegetables are high (Horticultural Statistics at a Glance. 2018) [9], while seeing the literatures, the knowledge and adoption of recommended cultivation practices were found to be less and the pest and diseases problem is increasing day by day. Hence, the agricultural production is low compare to the potential yields. There was a vast gap between the knowledge generalization and utilization of knowledge (Gunawardana & Sharma, 2007) [6]. One of the reasons is non-adoption of recommended scientific practices in which improper communication network among the farmers in seeking and sharing the information. According to Indian Council of Agricultural Research, only 45.00 per cent of the technologies are reaching the farmers, it may be due to various factors. Only few farmers shared their agricultural information to others (Vanaja, 2019) [14]. Efficient flow of information ensures social learning process and the community results in adoption of innovations.
The women’s contribution to the agriculture has been recognized and there is an essential need of relevant information and access for appropriate farm technologies to enhance their productivity. Even though the women acts as an important role in cultivation, study on women communication behavior in cultivation aspects is virtually absent. (Deepika verma, 2017) [2].
The successful communication strategies for the agricultural subjects are providing accessible and useful information at a minimal cost.

The present study explored the nature of communication networks related to vegetable cultivation. In this regard, the Social Network Analysis is widely employed for studying the social networks of farmers. Hence, the present study focused to identify the farmers (actors) and their relations (ties). Social Network Analysis was initially introduced as fundamental approach of studying social relations to know the relationship among people within a social group. It was explained as a study of human relationship by the visual representation (graph theory) (Borgatti and Everett, 1997) [13].

Freeman (1978) [4] explained the conceptual clarification of centrality of social networks such as degree, betweenness and closenesss centrality. Centrality is key of structural attribute of social networks. Degree means maximum node connections. Betweenness means potential for control of communication and closeness means independence. Ramirez (2013) [12] showed that Social Network Analysis was used for the dissemination and adoption of agricultural technology such as water conservation. Haldar *et al*., (2016) [7] found that nature of information network on agricultural practices. For describing the characteristics of node, the network centrality measures were used to identify the flow of information. They concluded that closeness and degree centrality were similar in terms of key actors concerned but betweenness centrality was distinct in terms of key actors among the farmers network. SNA gives perception on how society functions. SNA may be applied to a wide range of business problem such as strategy, sales and marketing, human resource, team-building, also knowledge management and collaboration (Andry Alamsyah, 2017) [1]. SNA provides an extra-ordinary scope to analyse a complex network system (Wasserman & Faust, 1994) and can study the relationship between the individuals (Haroon Malik, 2011) [8].

Dharanipriya and Karthikeyan (2017) [3] found that visual check of interconnections and direct linkages among the farmers. She found that only nine percent of respondents were connected in the network. She stated that information drawn from the social networks might be used for the further development and design of extension strategies for future innovative adoption process. This also facilitates the policy makers to draw the reliable information to help the farmers timely. They found that the actor 5 act as the more influential actor, gate keeper and controls the information flow in the network. The actor 22 and 23 were found to be independence/isolates in the network. Vishnu *et al*., (2018) [15] studied the livestock farmer's social network structures by using Gephi software and UCINET 6 with Gephi that was used for analyzing and visualizing the social structures. He found that veterinary doctors were having the highest degree of centrality. Goswami and Basu (2011) [5] examined the early adopters of chilli and wheat. Their prestige scores for the spread of chilli and wheat were calculated and ranking the four generations of farmers. Among them, early adopters of three generations had higher prestige scores and late generations were focus on associated factors of technology adoption.

In India, NSSO report (Report No.499; Access to modern technology for farming based on 59th Round, 2003) provides that 40.40% percent of farmers in the country accessed one or other sources for getting the information regarding to farming. In addition, Nain *et al.*, (2019) [10] commented that assessing the social networking among farmer's acts as an effective extension mechanism for a purposeful farmer to farmer learning exchange platform which paves for way for delivery of farmer led innovative extension technologies. So, it emerged as need of the hour to study how farmers seek and use instruction from different sources of information especially women. The study is undertaken to identify the sources of information considered beneficial, credible and preferable by the farmers; to find how the information from the identified sources are used.

In this context, information flow within the vegetable growers were collected and their pattern of communication source were assessed under four domains *viz.*, Planting/seedling material, Fertilizer application, Plant protection and Marketing. In order to increase the productivity in farmer's field, assessing the real network is important which identifies the drawbacks in farmer's network and how far the information has been shared with each other in cultivation to marketing.

Material and Methods

The study was conducted in two villages in Coimbatore district of Tamil Nadu, India. The present study was confined to *ex post-facto* research design. Being a vegetable belt, 90 women vegetable growers were selected randomly from two villages for the study. The data were collected through interview schedule and were analyzed using UCINET 6 software. The position/importance of various actors in the network were measured by a network metrics called centrality. Degree, closeness and betweenness were the most widely used indicators of centrality. In this study, farmers used various sources to obtain information such as agricultural depots, agriculture university, extension officials, cooperative society, input dealers, private consultancy, fertilizer shop, pesticide shop, friends and relatives, progressive farmers and whole saler/retailers for seeking the information on Planting material, fertilizer application, plant protection and marketing aspects.

Degree centrality shows the straight forward connections of every actor or respondents in a relationship. An actor or women who has the greatest number of straight connections with other actors fills the central position in the network. This measure entitled as the degree of participation of every actor in contact to the total number of ties between the actors of the network. There are two types of degree centrality measures. The indegree centrality shows the information seeking behaviour and outdegree centrality means sharing behaviour of the farmers.

Closeness centrality is the measure of autonomy or independence of the actors. Closeness centrality refers to the distance of an actor to other actors in the network *i.e*. how fast can an actor contact everyone in the network. The closeness centrality was measured by two sub groups like incloseness and outcloseness centrality. If the score value is less, they have close proximity with each other in getting the information sources. If the value is higher, the proximity will be wider and cannot be closer in getting the information.

Betweenness centrality indicates how the actor be the most direct link between two people in the networks. It acts as an intermediary. When actors are having with high betweenness centrality, it contributes an important information role as knowledge brokers or gatekeepers by filtering and importing information into the network.

These network structures play a pivotal role in spreading the emerging technologies. The information flow was found to be essential in a network with both strong and weak ties. The structure of the network can even determine the information one receives through social ties. Ties are nothing but the

connections. The major actors for sharing the information were identified through this network.

Results and Discussion

Information is one of the most important inputs of livelihood sustenance and communication networks play an important role in sharing this information in rural society. The results were discussed under the following subheads of Planting/seedling material, Fertilizer application, Plant protection and Marketing.

Communication network for getting information on planting/seedling material in vegetable cultivation

Selection of Planting/seedling material for vegetable is an important which decides the yield. Here, the communication network on planting/seedling material for vegetable growers was obtained from the farmers and they expressed that they got information from department of Horticulture, Agriculture University, input dealers, agri depots, private nursery, friends/relatives and progressive farmers. The results of the network centrality measures were presented in the table 1 and diagram depicted in the Figure 1.

Table 1: Network centrality measures on planting/seedling material

Centrality measures	Degree centrality		Closeness centrality		Betweenness
	In degree	Out degree	In closeness	Out closeness	Betweenness
Horti/Agri College/KVK	20	-	189	-	724.44
Agri depots	39	-	173	-	1292.553
Input Dealers	21	-	195	-	1480.463
Private Nursery	17	-	210	-	1119.86
Friends/relatives	33	-	179	-	3021.412
Progressive farmer	3	-	254	-	807.628
Mean	5.33	5.33	252.69	252.69	157.69
Standard deviation	6.28	6.68	29.30	43.88	399.98
Minimum	1	1	173	144	1.369
Maximum	39	49	347	383	3021.412

Network size = 96, Network density = 0.056, Avg. degree = 5.31
Total no. of ties =510

With regard to communication network on planting/seedling material, the network size and density was measured by the network cohesion. The size of the network was 96 (90 farmers, 2 formal sources and 4 informal sources). Every farmer has an average of 5.31 connections in the network. The total number of ties is 510 which indicated that all the actors were connected in the web of 510 relations in the social network. Network density for seeking information on Planting/Seedling material was 0.056. It implied that only 5.60 per cent of all possible direct linkages are present in the network and the farmers were not well connected to the sources of information.

Table 1 revealed that the maximum in degree centrality score was 39 which indicated that a farmer was contacted by a maximum of 39 of other women farmers in the network to get information related to planting/seedling material. So, the women farmers with highest in degree centrality score was considered to them which indicated that high prestige among the farmers network.

The highest in degree centrality score was agri-depots (39). It denotes that the farmers sought the information through agri depots. Next to Agri depots, farmers sought the information through friends and relatives (33). The in degree score of input dealers and Horticulture/Agriculture college/KrishiVigyan Kendra's was 21 and 20. The in degree score of Private nursery score and progressive farmer was 3. It indicated that farmers sought information from progressive farmer at very low level.

With regard to out degree centrality, those central actors/farmers who played the central role in sharing the planting/seedling information to other farmers in this network were identified. In this study, the farmer 22, 34 and 49 had the highest sharing behaviour among the farmers network. It was shown in the Figure 1. It indicates that these farmers were more influential than other farmers in the communication network. These actors/farmers can be considered as the most important channel for diffusion of information and innovation among the vegetable women farmers.

The mean in closeness and out closeness centrality score was 252.69 which denoted the average distance of farmer to all other farmers in the network. The maximum and minimum of in closeness was 347 and 173 respectively. The maximum and minimum of out closeness centrality was 383 and 144. It denotes the maximum and minimum distance of a farmer to all other farmers in the network. The highest in closeness and out closeness centrality scores of the farmers represent their level of freedom i.e., low level of participation in the network.

With regard to inclosenesss, the high score on in closeness centrality was progressive farmer (254) and private nursery (210). The in closeness centrality of input dealers, Horticulture/Agriculture College/KVK, friends and relatives and agri-depots were 195, 189, 179 and 173 respectively. The low score of agriculture depots (173) implied that the nearness of the farmer to all other farmers in seeking information. So this indicates that agriculture depots were the place where farmers get information on plants and seedling material.

With regard to out closeness, low out closeness centrality actor was 49, 61 and 62 which denoted that the nearness of farmer to all other farmers in sharing information in the network. So, these central actors may be taken care in the fast disposal of information to other fellow farmers in the village.

The mean betweenness centrality score was 157.69. The maximum betweenness score was friends/relatives (3021.412). The betweenness centrality score of Input dealers, Agri depots and Private nursery was 1480.463, 1292.553 and 1119.86 respectively. The betweenness centrality was Progressive farmer and Horticulture/Agriculture College/KVK was 807.628 and 724.44 respectively. It indicates that fellow farmers and their relatives are likely to play the gatekeepers and control the flow of information in the network.

The farmers with highest degree centrality and betweenness centrality indicate the central actors in the network and highest closeness centrality scores were found to be the isolates. Overall, the farmers seeking information related to

planting/seedling information through Agri depots and friends and relatives and 22, 34, 49, 61 and 62 are the major central actors identified in the communication network for sharing the information to other farmers in the network. Hence, they may be used in future course of action to diffuse technologies.

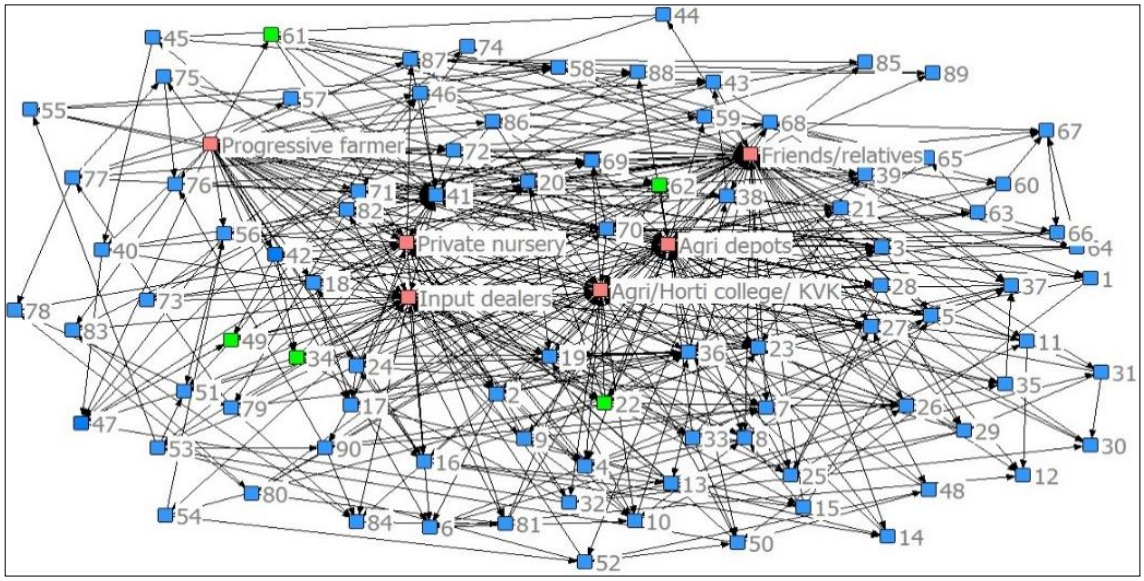

Fig 1: Women farmer's information network for planting/seedling material

Communication network for getting information on fertilizer application in vegetable cultivation.

The fertilizer application is important for plant growth. The communication network for getting fertilizer related information among the cultivators was collected. Agri depots, Private consultancy, Fertilizer shop, Cooperative society, Friends/relatives and Progressive farmers. The results of the network centrality measures were presented in the Table 2 and diagram in Figure 2.

Table 2: Network centrality measures on fertilizer application for plant growth

Centrality measures	Degree centrality		Closeness centrality		Betweenness
	In degree	Out degree	In closeness	Out closeness	Betweenness
Agri depots	31	-	175	-	885.144
Co-operative society	29	-	175	-	1292.938
Private consultancy	35	-	172	-	1434.608
Fertilizer shop	42	-	163	-	2093.336
Friends/Relatives	37	-	163	-	1923.072
Progressive farmer	25	-	170	-	195.426
Mean	6.63	6.63	208.92	208.92	113.92
Standard Deviation	7.66	8.82	16.35	23.13	353.70
Minimum	2	1	162	144	0.0
Maximum	42	51	243	313	2180.60

Network size = 96, Network density = 0.070, Avg. degree =6.61
Total no. of ties = 634

Regarding the communication network on fertilizer application for plant growth, the network size and density was measured by the network cohesion. The size of the network was 96 (90 farmers, 2 formal sources and 4 informal sources). The average degree value of 6.61 indicated that every farmer has value of 6.61 connections in the network. There were 634 number of ties in the network. It implied that all the actors were connected in the web of 634 relations in the social network. Network density for seeking fertilizer related information was 0.070. It implied that only 7.00 per cent of all possible direct linkages are present in the network and the farmers were not well connected to the sources of information.

Table 2 revealed that the mean of degree centrality was 6.63. The maximum in degree centrality score was fertilizer shop (42) which indicates that a farmer was contacted by a maximum of 42 of others in the network to get information related to fertilizer application for plant growth. So, the farmers with highest in degree centrality score was considered to them which indicate the high prominent among the farmers network. The next in degree centrality score was friends and relatives (37). The in degree score of private consultancy and agri depots were 35 and 31. The farmers sought the information from co-operative society and Progressive farmers with the score of 29 and 25 respectively. Overall, it indicated that farmers preferred to seek information from fertilizer shops compare to all other sources.

Regarding out degree centrality, those central actors/tomato growers who played the key role in sharing the fertilizer related information to other farmers in this network were identified. In this study, the farmer 1, 22 and 66 had the highest sharing behavior among their network and it was depicted in the Figure 2.It indicates that these farmers were more influential than other farmers in the communication network. These actors/farmers can be considered as the most important channel for diffusion of information and innovation among the farmers.

The mean in closeness and out closeness score was 208.92. It denoted the average distance of farmer to all other farmers in the network. The maximum and minimum of in closeness score was 243 and 162 respectively. The maximum and minimum of out closeness centrality score was 313 and 144 respectively. It indicated the maximum and minimum distance of a farmer to all other farmers in the network.

The high score on in closeness centrality was co-operative society and agri depots (175) followed by private consultancy (172) and progressive farmer (170). The in closeness centrality of fertilizer shop and friends/relatives were 163. The low score on friends/relatives and fertilizer shop indicate that the nearness of the farmer to all other farmers in seeking information.

With regard to out closeness, low out closeness centrality actors were 1, 45 and 59 which denoted that the nearness of farmer to all other farmers in sharing information with the other fellow farmers.

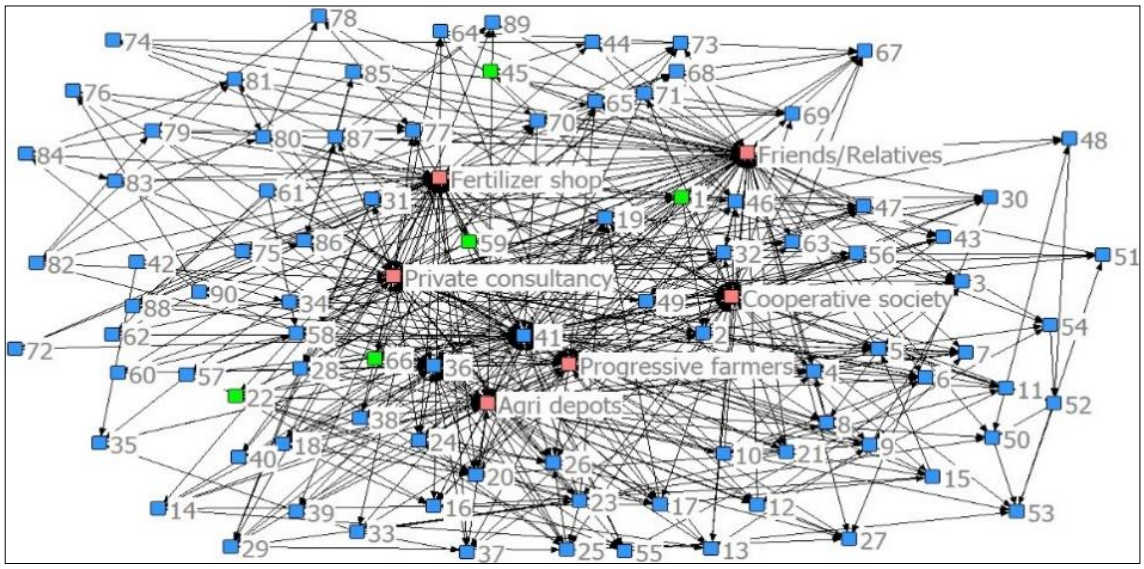

Fig 2: Women farmer's information network for fertilizer application

The mean betweenness centrality score was 113.92. The farmers with highest betweenness score was 2180.60. The betweenness score was high on fertilizer shop (2093.33). The betweenness score of friends and relatives, private consultancy and cooperative society were 1923.07, 1434.60 and 1292.93.Hence the fertilizer shop act as controlling the flow of information on fertilizer application.

The farmers with highest degree centrality and betweenness centrality indicate the key actors in the network and highest closeness centrality scores were found to be kept away from the others. Overall, the farmers seeking information related to fertilizer application through fertilizer shop and friends/relatives and 1, 22, 45, 59 and 66 are the major central actors identified in the communication network for sharing the information to other farmers in the network. Hence, they may be used in the technology transfer of agriculture and horticulture information to the village people.

Communication network for getting information on plant protection in vegetable cultivation

Pest and disease management is a basic requirement to get higher yield and income. In this connection, the communication network on plant protection of tomato growers was obtained from the farmers. They informed that they got information related to pest and diseases from Pesticide shops, Private consultancy, Agriculture College, Extension officials, friends/relatives and progressive farmers. The results of the network centrality measures were presented in the Table 3 and Figure 3.

Table 3: Network centrality measures on plant protection

Centrality measures	Degree centrality		Closeness centrality		Betweenness
	In degree	Out degree	In closeness	Out closeness	Betweenness
Agriculture College	24	-	178	-	438.195
Extension officials	46	-	153	-	1571.696
Private consultancy	39	-	162	-	1848.631
Pesticide shop	54	-	146	-	1833.661
Progressive farmers	21	-	176	-	798.982
Friends/relatives	33	-	169	-	1652.141
Mean	6.80	6.80	209.10	209.10	114.09
Standard deviation	8.74	8.65	22.05	22.86	351.32
Minimum	1	1	146	136	0.48
Maximum	54	56	266	274	1848.631

Network size = 96, Network density = 0.071, Avg. degree = 6.78
Total no. of ties =650

The network size and density was measured by the network cohesion. The size of the network was 96 (90 farmers, 2 formal sources and 4 informal sources). The average degree value of 6.78 indicated that every farmer had value of 6.78 connections in the network. The total number of ties was 650, which denoted that all the farmers were connected with the

web of 650 relations in the social network. Network density for plant protection was 0.071. It implied that only 7.10 per cent of all possible direct linkages are present in the network and the farmers were not well connected to the sources of information.

Table 3 revealed that the maximum in degree centrality score was 54 which indicated that a farmer was contacted by a maximum of 54 of other farmers in the network to get information related to plant protection. So, the farmers with highest in degree centrality score was considered to have high prominence among them.

The highest in degree centrality score was pesticide shop (54). It denotes that majority of the farmers sought information through pesticide shop. The farmers sought the information through extension officials with the score of 46. The in degree score of private consultancy, friends and relatives, agriculture college and progressive farmers were 39, 33 24 and 21. It was shown in the Figure 3. Overall, in degree centrality denotes the farmers were getting information mostly from pesticide shops.

With regard to out degree centrality, those central actors/farmers who played the central role in sharing the plant protection information to other farmers in this network were identified. In this study, the actor 22, 49 and 74 had the highest sharing behavior and shown in the Figure 3. It indicates that these farmers were more influential than other farmers in the communication network. These actors/farmers can be considered as the most important pathway for the communication on agriculture, horticulture and for the latest updates.

With respect to closeness, the mean of in closeness and out closeness score was 209.10. The minimum in closeness score was 146. The high in closeness centrality score was Agriculture College (178) followed by Progressive farmers (176). The in closeness centrality score of friends and relatives and private consultancy were 169 and 162.The in closeness centrality of Extension officials and pesticide shop were 153 and 146. Hence the low in closeness centrality score showed that the farmers easily sought information from the pesticide shop and extension officials like Horticultural officer, Agricultural officer and Assistant Horticulture/Agriculture officer.

In response to our closeness centrality, the out closeness centrality was minimum in the actors such as 15, 22 and 64 who are the major channels of information in order to bridge the other farmers in the network.

The minimum and maximum out closeness score was 136 and 274 respectively. The minimum out closeness centrality for the respondent's was1 and 56. These actors had high participation in sharing the information on plant protection aspects.

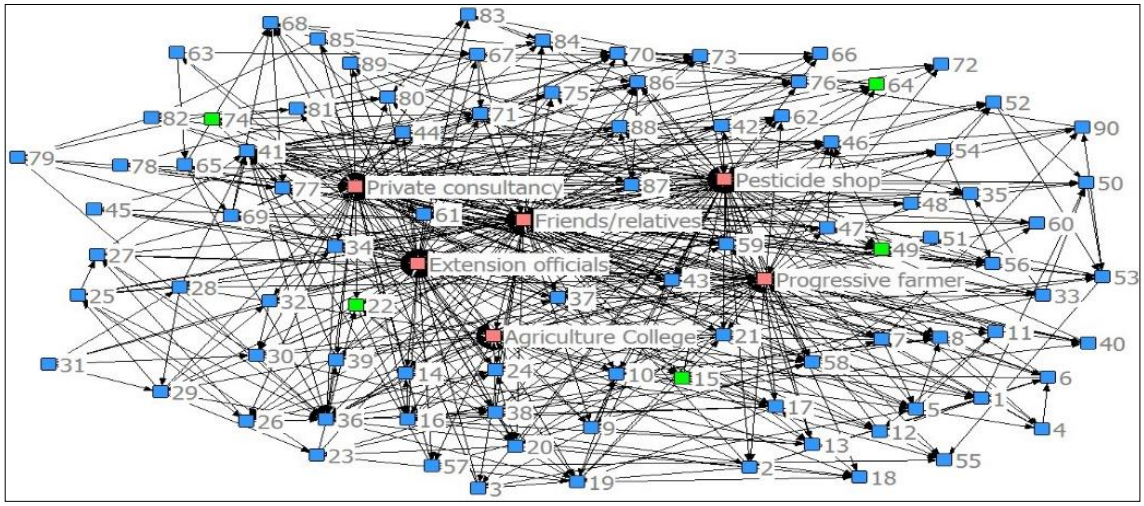

Fig 3: Women farmers' information network for plant protection

The mean of betweenness centrality score was 114.09. The standard deviation of betweenness centrality was 351.32. The maximum betweenness centrality score was private consultancy (1848.631) followed by pesticide shop (1833.661). The farmers with highest betweenness score are likely to play the guard and protector role in the network. The betweenness centrality score on friends/relatives, extension officials were 1652.141 and 1571.696 respectively. The low betweenness centrality of progressive farmers and Agriculture College were 798.982 and 438.195. Hence, the pesticide shop acts as a gate keeper in controlling the flow of plant protection information.

The farmers with highest degree centrality and betweenness centrality indicated the central actors in the network and highest closeness centrality scores were found to be the isolates. Overall, the farmers seeking information related to plant protection through pesticide shop and extension officials 15, 22, 49 and 64 are the major central actors identified in the communication network for sharing the information to other farmers in the network. Hence, they may be used in future course of action to diffuse technologies.

Communication network for getting information on marketing for the sales of vegetables

Marketing of vegetables is an important which decides profit and income. The information network on marketing was got from the farmers. They said that they got information on marketing from extension officials, market, whole saler/retailer, friends/relatives. The results of the network centrality were presented in the Table 4 and diagram depicted in the Figure 4.

With regard to communication network on marketing, the network size and density was measured by the network cohesion. The size of the network was 94 (90 farmers, 1 formal source and 3 informal sources). The average degree value of 5.39 indicated that every farmer has value of 5.39 connections in the network. The total number of ties on marketing was 510 which denoted that all the tomato farmers were connected in the web of 510 relations in the network.

Network density for marketing was 0.058. It implied that only 5.80 per cent of all possible direct linkages are present in the network and the farmers were not well connected to the sources of information.

Table 4: Network centrality measures on marketing

Centrality measures	Degree centrality		Closeness centrality		Betweenness centrality
	In degree	Out degree	In closeness	Out closeness	Betweenness
Extension officials	31	-	161	-	701.571
Friends/ Relatives	37	-	155	-	1581.957
Market	43	-	145	-	2864.033
Whole saler/retailer	47	-	142	-	3470.956
Mean	5.41	5.41	229.43	229.43	131.48
Standard Deviation	9.03	5.09	44.38	24.54	486.84
Minimum	0	2	142	156	0
Maximum	47	40	558	314	3470.956

Network size = 94, Network density = 0.058, Avg. degree = 5.39
Total no. of ties =510

Table 4 revealed that the maximum in degree centrality score was 47 which indicated that a farmer was contacted by a maximum of 47 of other farmers in the network to get information related to marketing. So, the farmers with highest in degree centrality score was considered to them. The highest in degree centrality score was high in whole saler/retailer (47) followed by Market (43). The in degree centrality score of friends/relatives and extension officials were 37 and 31.

The maximum out degree centrality score was 40. It implied that the farmer shared the information to a maximum of 40 other farmers in the network. The mean value of degree centrality indicated that every farmer has an average of 5.41 connections in the network. The farmer 9, 22 and 57 had the highest sharing behaviour among the farmers network and it was depicted in the Figure 4. It indicates that these farmers were more important for sharing the information.

The mean in closeness and out closeness centrality score of 229.43. It denoted the average distance farmer to all other farmers in the network. The maximum of in closeness score was 558. The minimum in closeness score was 142. This refers to the nearness of the farmer to all other farmers in seeking information. The highest in closeness centrality score was extension officials (161) followed by friends/relatives (155). The in closeness centrality for market and whole saler/retailer score was 145 and 142 respectively. Overall, in degree centrality denotes that the whole saler/retailer and market were the place where farmers get information on marketing.

The maximum and minimum score of out closeness centrality was 314 and 156 respectively. The minimum out closeness centrality among the farmers was 13, 22 and 46. They act as an important role in sharing more information to others.

The mean for betweenness centrality score was 131.48. The maximum betweenness score was 3470.956 which indicated the source on whole saler/retailer. The farmers with highest betweenness score are likely to play the gatekeepers role in the network. The betweenness score on market, friends/relatives and extension officials score was 2864.033, 1581.957 and 701.571 respectively. So, whole saler/retailer act as gatekeeper's role in the marketing network.

The farmers with highest degree centrality and betweenness centrality indicate the central actors in the network and highest closeness centrality scores were found to be the isolates. Overall, the farmers seeking information related to marketing information through whole saler/retailer, market and 9, 13, 22, 46 and 57 are the major central actors identified in the communication network for sharing the information to other farmers in the network. Hence, they may be used in future course of action to diffuse technologies.

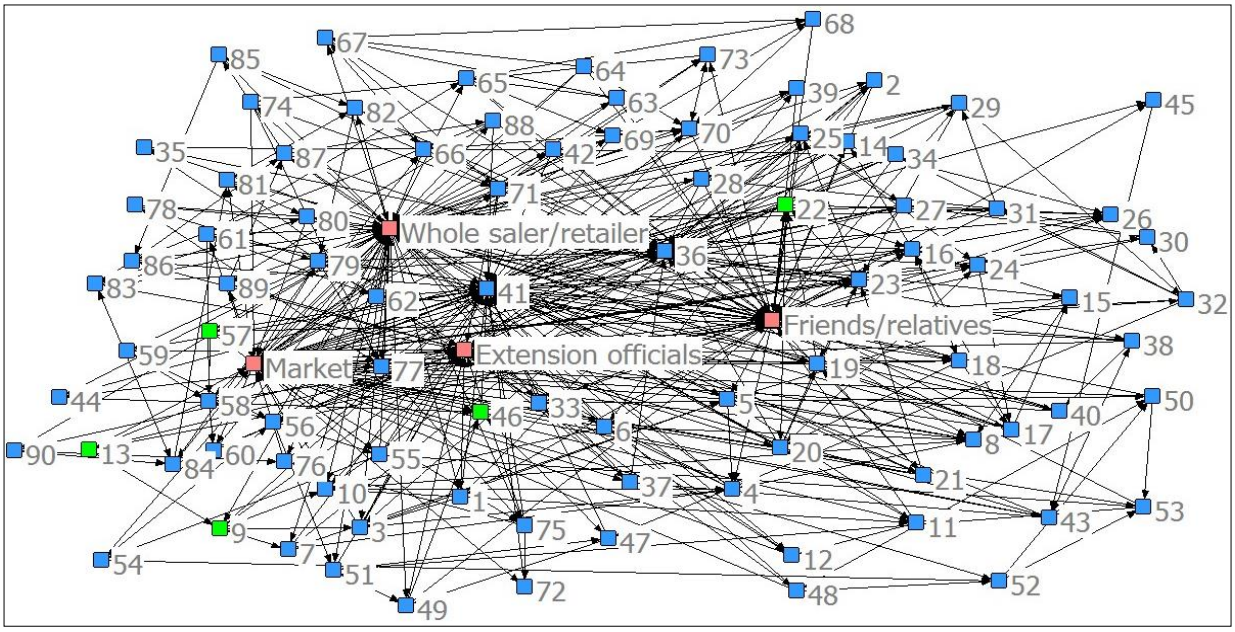

Fig 4: Women farmers' information network for marketing

Conclusion

The information sources for vegetable growers were identified in this study are agricultural depots, agriculture university, extension officials, cooperative society, input dealers, private consultancy, fertilizer shop, pesticide shop, friends and relatives, pogressive farmers and whole saler/retailers. Even though the farmers are seeking information from the above sources, only five to seven per cent of the information is shared among the farmers. Hence, the actors or farmers who were identified in the network system may be identified as a channel for sharing the information to the fellow farmers in the villages. The effect of this network may be useful in implementing new programmes or schemes and effective dissemination of information at right time. As seen in the Social Network Analysis, importance has to be given to farmer-farmer communication *i.e.*, Farmers association, Famers Interest Group, Farmer Producer Organization, Self-Help Groups etc., which increases the spread of communication to the fellow farmers and as a whole village. This study may be useful in implementing the new programmes or schemes and make them effective dissemination of the information at right time. It decreases the time consumption for adopting the new technology among the farmers. The obstacles observed in the information seeking and sharing for cultivating a crop may help the policy makers to bring out convenient steps to overcome the troubles faced by the women farmers.

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