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Influence of Social Networks on Information Acquisition and Adoption of Soil Fertility Management Technologies

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Abstract

Information acquisition on agricultural technologies and adoption are the keys to increase farm productivity. Farmers often rely on social networks to acquire and transfer agrarian knowledge. The main purpose of the study was to assess the influence of social networks on information acquisition and adoption of soil fertility management (SFM) technologies. A total of 210 farmers (105 from a progressive village and another 105 from a less-progressive village) were interviewed with a structured questionnaire. Stratified random sampling technique was used to select the farmers for collecting data. A 4-point rating scale was used to assess the influence of different social networks. Major findings reveal that different social networks highly influenced the farmers in both villages. Comparative influences of different social networks demonstrate that SAAOs, field day meeting and farmers' meeting had high influence in the progressive village. In contrary, NGO group, friends and neighbor had strong influence in the less-progressive village. The overall influence of social networks was higher in progressive village compare to the less-progressive one in both cases. Therefore, proper use and management of social networks should be enhanced for better knowledge transfer and adoption of SFM technologies as a whole.

Keywords: *Influence, social networks, information acquisition, adoption, soil fertility management (SFM).*

Introduction

Information acquisition on agricultural technologies and adoption are the keys to increase farm productivity (Pratiwi and Suzuki, 2017). Adoption of agricultural technologies has often been a slow process, and it is determined by various factors (Bandiera and Rasul, 2002). Farmers' access to/and engagement with social networks play a dynamic role in the innovation-decision process starting from knowledge to confirmation of adoption or rejection regarding agricultural technologies. Other than formal sources, farmers often rely on social networks to acquire and transfer agricultural knowledge (Boahene *et al*., 1999; Lyon, 2000; Conley and Udry, 2010). A social network is a social structure composed of a set of social actors (such as a social organization), sets of dyadic ties, and the links and interactions between actors (Kocak, 2014; O'Malley and Marsden, 2008). Interpersonal interaction mobilized through social networks influence an individual's behavior and learning ability. Rydberg *et al*. (2008) reported that regular contacts with other farmers can influence farmer's attitude and perception towards an innovation. Farmers can learn about different aspects of agricultural systems when frequently visit to personal localite (e.g. friends) or cosmopolite (e.g. agriculture office).

Soil and land resources are under constant threats due to overexploitation for crop production in developing countries like Bangladesh. Producing more crops to feed

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ever-growing population drives land degradation leading to soil fertility decline (Siddique *et al*., 2014). Intensive agro-chemicals based agricultural practices have been dominating since the last few decades, and it is considered as one of the major causes of soil fertility decline. Maintaining soil fertility is very important for keeping crop production up to the mark in a sustainable manner. Adoption of soil fertility management (SFM) technologies is inevitable in this regards.

Farmers are also concerned about soil fertility decline and its potential remedies. Some studies reported existing and potential SFM practices in Bangladesh such as crop rotation, legume crop cultivation, green manure crops, mixed cropping, mulching, cow dung, compost, quick compost, dike planting, azolla, soil amendments, etc. (Farouque and Tekeya, 2008; Hossain, 2001). Farmers locally have acquired knowledge through experience (Laekemariam *et al*., 2017), but yet they depend on social networks regarding soil fertility management and other farming information. Proper information acquisition and transfer regarding SFM technologies could be an efficient way of adopting appropriate technology by the farmers (Frouque and Tekeya, 2008). Extension programs assume that information and innovation diffuse through community networks and interpersonal relationships (Ross, 2017). However, there is a paucity of research in the context of Bangladesh to explore the influence of social networks in information acquisition and adoption of SFM technologies.

A bunch of studies have been found regarding farmers' preferences and use of information sources (Gupta and De, 2011; Sakib *et al*., 2015; Rahman *et al*., 2016), information needs and management behaviors of the farmers (Gedam and Padaria, 2014; Saha and Devi, 2010), integrated soil fertility management (ISFM) technologies (Farouque and Tekeya, 2008; Vanlauwe *et al*., 2015), knowledge and perception on soil fertility management (Dawoe *et al*., 2012; Omari *et al*., 2018). Still, there is a paucity of information regarding the influence of various social networks regarding soil fertility management information and adoption. Therefore, the study was conducted to assess the influence of different social networks on information acquisition and adoption of soil fertility management (SFM) technologies.

Methodology

Study area and sample

The study was conducted in two villages, namely - Tarakandi (Urfa Union) and Sibpur (Nakla Sadar) of Nakla upazila, Sherpur (Figure 1). The study area was selected purposively for investigation with consultation with Upazila Agriculture Officer (UAO) of Nakla. The study area possesses agricultural diversification with an average cropping intensity of 218 percent (Khatun *et al*., 2017). However, the Department of Agricultural Extension (DAE) and other agricultural organizations reported the area as declined soil fertility and nutrients leading to reduced crop yield (Farouque and Tekeya, 2008). These reasons influenced the researchers to conduct the research in that area. Stratified random sampling technique was used to find out the sample of the study. A total of 105 farmers from the progressive village (Sibpur) and another 105 farmers from the less-progressive village (Tarakandi) were selected as sample for the interview survey.

Thus, a total of 210 farmers constituted the sample size of the study. Upazila Agriculture Officer (UAO) of the study area helped find the progressive and less-progressive villages. Some criteria were considered to define progressive and less-progressive villages, viz. distance from town, communication facilities, and availability of information sources (e.g. extension organizations, NGOs, etc.).

Data collection and analysis

Both primary and secondary data were used to shape the findings of the study. Two separate focus group discussions (FGDs) were conducted with progressive and less-progressive farmers. The findings of the FGDs used to construct the survey questionnaire. Primary data were collected from the farmers using structured questionnaire in a face-to-face situation. Secondary data were collected from different journals, theses and contents from the internet. For the interview of progressive and less-progressive villages, the farmers were asked the same set of questions to obtain their responses. The Statistical Package for Social Sciences (SPSS)-20 and MS Excel were used to analysis data and to prepare graphs.

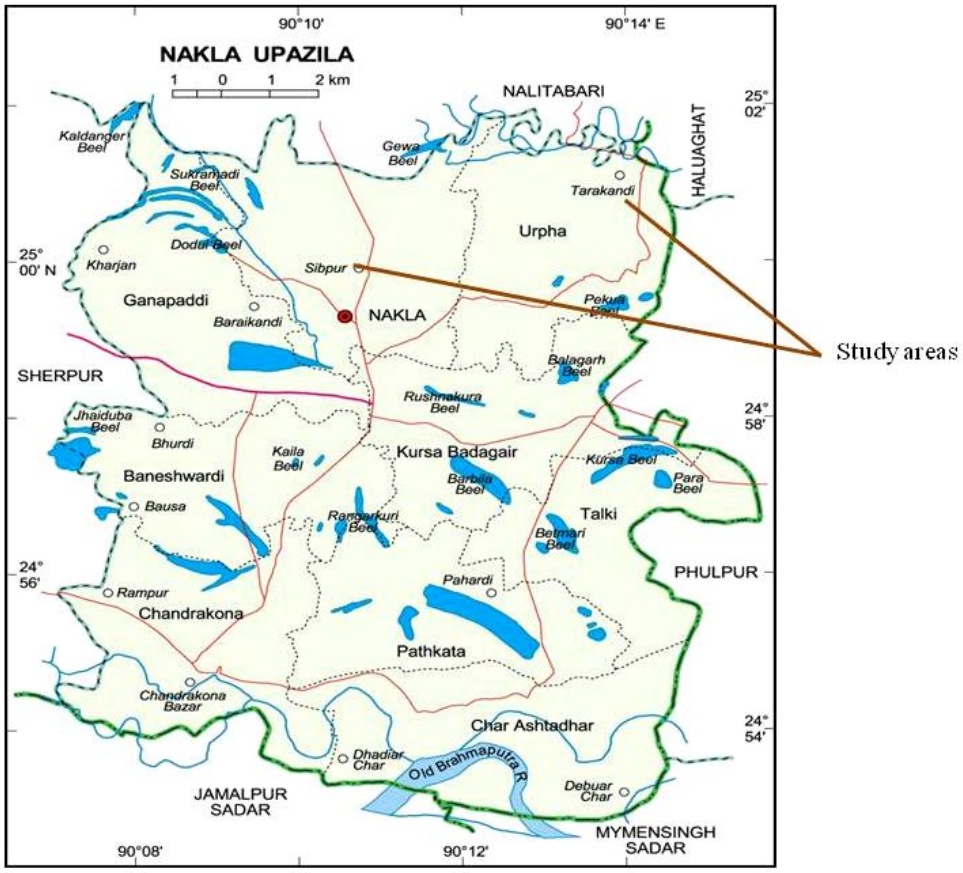

Figure 1 Map of Nakla Upazila showing study areas

Measurement of Influence

A 4- point rating scale was used with the responses as no influence, low, medium and high influence on different social networks and their corresponding scores were 0, 1, 2 and 3, respectively. A total of sixteen social networks were identified and adapted for this study that derived from the focus group discussion with farmers and experts. Hence, the scale score ranged from 0 to 48, where 0 indicated "no influence" and 48 indicated "high influence" of the social networks. To find out the most influential network, rank order was carried out based on the influence index using the following formula (Equation 1). According to the formula, the total score for individual social network could range from 0 to 315.

$$Inf.Index = NI\times0+LI\times1+MI\times2+HI\times3 \ldots\ldots(1)$$

Where, NI = number of responses with no influence; LI = number of responses with low influence; MI = number of responses with medium influence; and HI = number of responses with high influence.

Results and Discussion

Potential social networks

Two focus group discussions (FGDs), each consisting of 10 farmers, were administered with a total of 20 farmers (i.e., one in progressive village and another one in less-progressive village) of the study area to find out potential social networks. A total of sixteen social networks were identified that influence farmers' farming decision, especially regarding information acquisition and adoption of SFM technologies (Figure 2). Farmers usually contact with the networks and *vice versa* to acquire useful farming information which finally helps them make an appropriate adoption decision. The outputs of the FGDs were adopted in the survey questionnaire later on to assess the influence of these social networks.

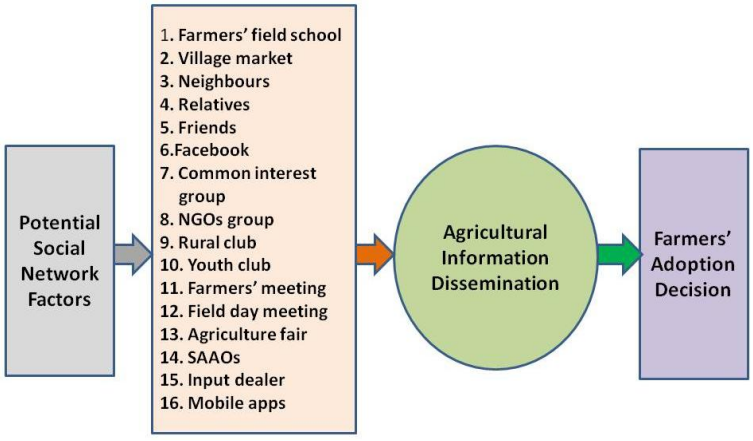

Figure 2 Potential social network factors and their roles

Influence of social networks on information acquisition and adoption of SFM technologies

The influence of social networks was assessed into two dimensions, such as i) information acquisition regarding SFM technologies, and ii) adoption of SFM technologies. Rank order was used to assess the influence of social networks perceived by the farmers. The calculated influence index ranged from 0 to 315. A comparison was administered to find out the comparative influence of sixteen different social networks to the farmers residing in progressive and less-progressive villages.

Table 1 Influence of social networks on information acquisition by the farmers in less-progressive and progressive villages (n = 210)

Social networks	Less- progressive village						Progressive village					
	Extent of influence				Inf index	Rank order	Extent of influence				Inf index	Rank order
	N	L	M	H			N	L	M	H		
Farmers' field school	20	28	34	23	165	13	10	21	39	35	204	11
Village market	10	25	30	40	205	4	05	35	35	35	210	8
Neighbors	14	23	32	36	197	6	10	19	40	36	207	9.5
Relatives	16	20	35	34	192	9	09	19	39	38	211	7
Friends	12	25	30	38	195	7	07	20	35	43	219	4
Facebook	32	28	25	20	138	16	10	15	45	35	215	6
Common interest group	21	40	19	25	153	14	15	25	30	35	200	14
NGO group	08	21	30	46	215	1	05	32	45	23	191	16
Rural club	12	39	24	30	177	11	08	27	30	40	207	9.5
Youth club	15	25	30	35	190	10	10	17	33	45	218	5
Farmers' meeting	10	25	25	45	210	2	10	20	25	50	220	3
Field day meeting	10	30	24	41	201	5	07	18	31	49	227	2
Agriculture fair	21	42	23	19	145	15	10	29	30	36	197	15
SAAOs	11	23	30	41	206	3	06	15	35	49	232	1
Input dealer	16	23	27	39	194	8	10	32	30	33	201	13
Mobile apps	21	29	25	31	172	12	09	28	30	38	202	12

Note: Inf. Index = Influence index, N= No, L= Low, M= Medium and H=High

Regarding information acquisition on SFM, Sub Assistant Agriculture Officers (SAAOs) was the top most influential social network (Inf. Index = 232) in the progressive village (Table 1). Field day meeting (Inf. Index = 227) and farmers' meeting (Inf. Index = 220) were second and third most influential social networks, respectively. NGO group (Inf. Index = 191) was the least influential social network in progressive village. On the other hand, the NGO group with an Influence index of 215 was the top most influential social network in less-progressive village. Farmers'

meeting (Inf. Index = 210) and SAAOs (Inf. Index = 206) were the second and third most influential social networks, respectively (Table 1). Facebook (Inf. Index = 138) was the least influential network in less progressive village.

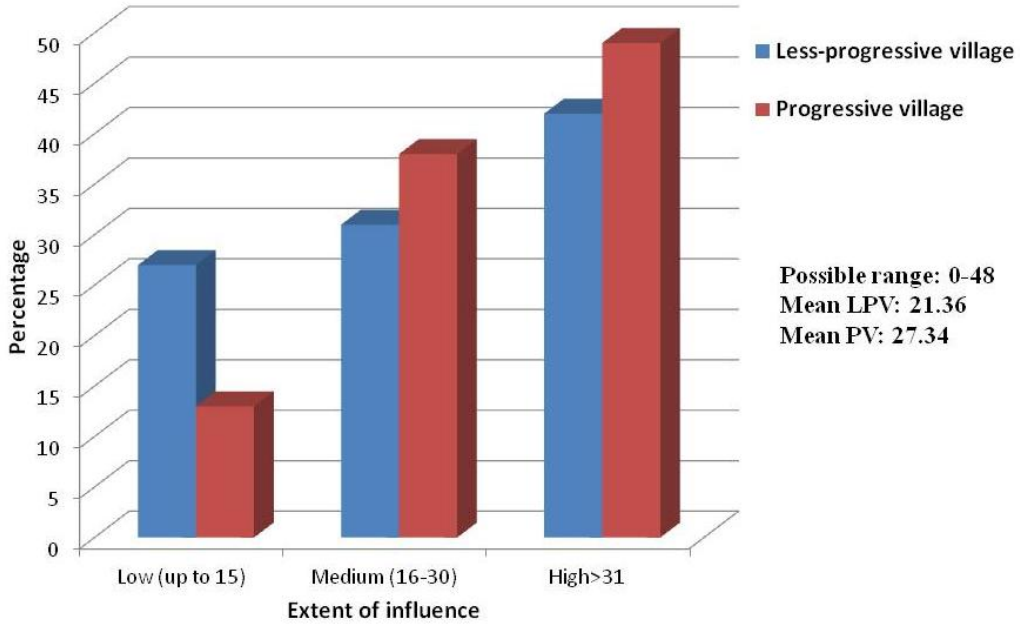

Figure 2 Overall influence of social networks on information acquisition by the farmers in less-progressive and progressive villages (n = 210)

In case of overall influence of different social networks, farmers in both progressive and less-progressive villages were found highly influenced by social networks regarding information acquisition about SFM technologies (Figure 2). Figure 2 further shows that farmers in the progressive village were comparatively more influenced by different social networks than the less-progressive village.

Regarding the adoption of SFM technologies, Sub Assistant Agriculture Officers (SAAOs) was the top most influential social network (Inf. Index = 245) in the progressive village (Table 2). Farmers' field school (Inf. Index = 222) and field day meeting (Inf. Index = 220) were second and third most influential social networks, respectively. Friends (Inf. Index = 200) was the least influential social network in progressive village. On the other hand, the NGO group with an Influence index of 228 was the top most influential social network in less-progressive village. Friends (Inf. Index = 211) and neighbors (Inf. Index = 210) were the second and third most influential social networks, respectively (Table 2). Facebook (Inf. Index = 111) was the least influential network in less progressive village.

Table 2 Influence of social networks on adoption of SFM technologies by the farmers in less-progressive and progressive villages (n = 210)

Social networks	Less-progressive village						Progressive village					
	Extent of influence				Inf index	Rank order	Extent of influence				Inf index	Rank order
	N	L	M	H			N	L	M	H		
Farmers' field school	17	22	38	28	182	10	05	19	40	41	222	2
Village market	11	26	32	36	198	7.5	04	30	39	32	204	12
Neighbors	10	20	35	40	210	3	12	21	32	40	205	10
Relatives	11	19	37	38	207	4	05	28	42	30	202	14
Friends	08	23	34	40	211	2	10	25	35	35	200	16
Facebook	35	37	25	08	111	16	15	15	40	37	206	11
Common interest group	15	35	25	30	175	12	10	15	38	42	217	4
NGO group	07	18	30	50	228	1	07	28	35	35	203	13
Rural club	11	42	26	26	175	13	07	20	35	43	216	5
Youth club	15	25	30	35	190	9	10	15	40	40	215	6
Farmers' meeting	10	27	33	35	198	7.5	10	20	35	40	210	7.5
Field day meeting	15	30	30	30	180	11	05	25	30	45	220	3
Agriculture fair	15	40	30	20	160	14	10	20	35	40	210	7.5
SAAOs	09	26	32	38	204	6	05	10	35	55	245	1
Input dealer	11	23	28	43	206	5	04	30	35	36	208	9
Mobile apps	35	35	25	10	115	15	05	25	39	36	201	15

Note: Inf. Index = Influence index, N= No, L= Low, M= Medium and H=High

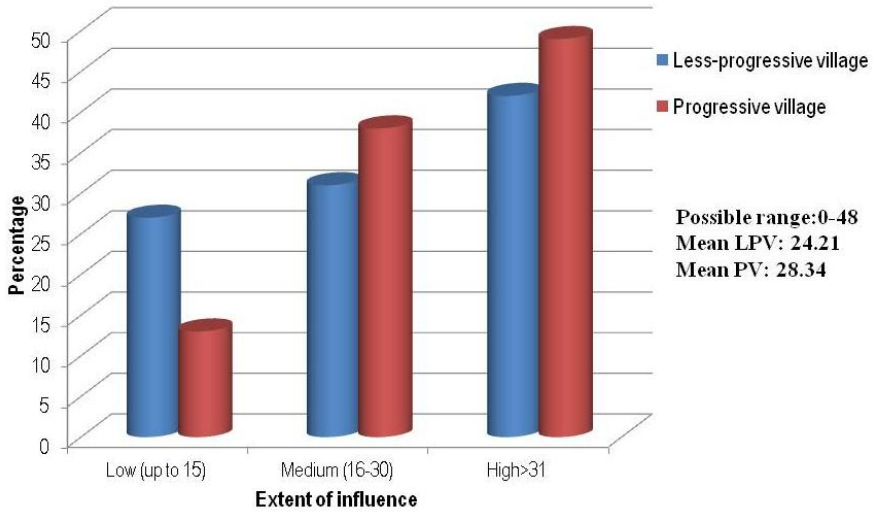

Figure 3 Overall influence of social networks on adoption of SFM technologies by the farmers in less-progressive and progressive villages (n = 210)

In case of overall influence of different social networks, farmers in both progressive and less-progressive villages were found highly influenced by social networks regarding the adoption of SFM technologies (Figure 3). Figure 3 further shows that farmers in the progressive village were comparatively more influenced by different social networks than the less-progressive village.

Discussion

Several social networks have been reported that are available and generally used by farmers in the study area. This indicates that farmers are concern about different information sources around their social sphere from where they gather necessary farming information. The findings further represent that farmers usually reach different social networks for the adoption decision of agricultural technologies (Table 2). The findings indicate that social networks have a high influence on information acquisition and adoption of SFM technologies in both progressive and less-progressive villages (Figure 2 and 3). Generally, the farmers are skeptical about new technologies due to perceived risk and uncertainty. Farmers are overcoming their doubt and taking adoption decision based on their regular contact with different social networks and observing the activities of fellow farmers. Rahman and Haque (2011) stated that the individual has more ties with social networks had better risk management strategies and position in society. Bulkey and Alstyne (2010) reported that a complete understanding of different types of efficiency is associated with social networks. Regarding information acquisition and adoption of SFM technologies, SAAOs were found as the most influential social network in the progressive village (Table 1). SAAOs contribute significantly to increasing agricultural production of the farmers through advice and information. Bose *et al*. (2014) reported that SAAOs play an important role in disseminating agro-technological to the farmers for farm improvement. The findings may be due to that they frequently visit the progressive village because of the short distance from the agriculture office. Field day meeting and farmers' meeting are facilitated by extension providers. Farmers acquire and transfer useful information from/among others through conversation in the meeting. On the contrary, the NGO group plays a significant role in information acquisition and transfer of technologies in the less-progressive village (Table 2). Although the SAAOs are supposed to the main extension providers in the rural areas, this finding indicates something else. Lack of communication facilities or lack of interests of the SAAOs could be responsible for this. Hence, NGOs focused on the less-progressive areas where government facilities are drop behind. According to Roy *et al*. (2017), NGOs work in the less-progressive and vulnerable areas in Bangladesh for agricultural and socio-economic development of the communities. The findings also indicate that friends and neighbors play important role in disseminating farming information in the less-progressive village. Several reasons could be responsible for this, such as no cost involvement, easy to communicate and interpersonal trust. Das (2012) reported that most agricultural information comes from interpersonal contacts rather than mass contacts.

Conclusion

The study identified some potential social network factors that play important role in disseminating agricultural information. For both cases, personal localite factors such as NGO groups, friends and farmers' meeting had very high influence in the less-progressive village while personal cosmopolite factors such as SAAOs and field day meeting, farmers' field school had very high influence in the progressive village. The overall influence of social network factors was higher in progressive village compare to the less progressive one in both cases. Therefore, proper use and management of social network factors should be enhanced for better knowledge transfer and adoption of SFM technologies as whole.

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References

Bandiera, O. and I. Rasul. 2002. Social Networks and Technology Adoption in Northern Mozambique. *The Economic Journal*, 116(514): 869–902.

Boahene, K., T.A. Snijders and H. Folmer. 1999. An integrated socioeconomic analysis of innovation adoption: the case of hybrid cocoa in Ghana. *Journal of Policy Modeling*, 21:167–184.

Bose, R., M.A. Hossain, M.M. Anam, M. Hasnat and H. Kabir. 2014. Performance of sub-assistant agricultural officer as a professional leader. *International Journal of Natural and Social Sciences*,1: 41-47.

Bulkey, N. and M. W. Alstyne. 2010. *An Empirical Analysis of Strategies and Efficiencies in Social Network*. Boston University School of Management Research Paper No. 2010 -29.

Conley, T. G. and C. R. Udry. 2010. Learning about a new technology: pineapple in Ghana. *American Economic Review*, 100(1): 35–69.

Das, D. 2012. Sources of Agricultural Information among Rural Women: A village level study in Assam. *International Journal of Economics and Research*, 3(5): 1-12.

Dawoe, E.K., J. Quashie-Sam, M.E. Isaac and S. K. Oppong. 2012. Exploring farmers' local knowledge and perceptions of soil fertility and management in the Ashanti Region of Ghana. *Geoderma*, 179–180: 96–103.

Farouque, M.G. and H. Tekeya. 2008. Farmers' Use of Integrated Soil

Fertility and Nutrient Management Practices for Sustainable Crop Production: A Field-level Study in Bangladesh. *American Journal of Agricultural and Biological Sciences*, 3(4): 716-723.

Gedam, P.C. and R.N. Padaria. 2014. Information Needs of Orange Growers of Maharashtra. *Indian Research Journal of Extension Education*, 14(1): 99-101.

Gupta, B.K. and D. De. 2011. Media possession and information source utilization pattern of rural women regarding child health care management. *Journal of Communication Studies*, 29:95-102.

Hossain, M.Z. 2001. Farmer's view on soil organic matter depletion and its management in Bangladesh. *Nutrient Cycling in Agroecosystems*, 61(1-2): 197-204.

Khatun, A., N. Parvin, M.M.R. Dewan and A. Saha. 2017. Cropping Patterns in Mymensingh Region: Diversity, Constraint and Potential. Bangladesh Rice Journal, J. 21(2): 217-235.

Kocak, N. G. (2014). Social Networks and Social Network Analysis. *International Journal of Business and Social Science*, 5(2): 126-135.

Laekemariam, F., K. Kibret. and T. Mamo 2017. Farmers' soil knowledge, fertility management logic and its linkage with scientifically analyzed soil properties in southern Ethiopia. *Agriculture & Food Security*, 6(57): 1-12.

Lyon, F. 2000. Trust, networks and norms: the creation of social capital in agricultural economies in Ghana. *World Development*, 28:663–681.

O'Malley, A.J. and P.V. Marsden. 2008. The Analysis of Social Networks. *Health Services and Outcomes Research Methodology*, 8(4): 222–269.

Omari, R.A., S.D. Bellingrath-Kimura, E.S. Addo, Y. Oikawa and Y. Fujii. 2018.Exploring Farmers' Indigenous Knowledge of Soil Quality and Fertility Management Practices in Selected Farming Communities of the Guinea Savannah Agro-Ecological Zone of Ghana. *Sustainability*, 10: 1034.

Pratiwi, A. and A. Suzuki. 2017. Effects of farmers' social networks on knowledge acquisition: lessons from agricultural training in rural Indonesia. *Journal of Economic Structure*, 6(8): 1-23.

Rahman, M.A. and S. Haque. 2011. Social Networks in Rural Situation: A Case Study in Mymensingh District of Bangladesh. *The Agriculturists*, 9(1&2): 73-81.

Rahman, M.A., S.B. Lalon and M.H. Surya. 2016. Information sources preferred by the farmers in receiving farm information. *International Journal of Agricultural Extension and Rural Development*, 3(12): 258-262.

Ross, M. 2017. Leveraging Social Networks for Agricultural Development in Africa. PhD thesis. Wageningen University, the Netherlands.

Roy, I., T.A. Raguib and A.K. Sarker. 2017. Contribution of NGOs for Socio-Economic Development in Bangladesh. *Science Journal of Business and Management*, 5(1): 1-8.

Rydberg, A., J. Olsson, M. Gilbertsson and P.A. Algerbo. 2008. *Data- och informationshantering i lantbruket – ett vaxande problem*. Rapporter lantbruk och industri, R 365.

Saha, B. and R. Devi. 2010. Information Management Behaviour of Traditional Fish Farmers in Assam. *Indian*

Research Journal of Extension Education, 14(1): 11-16.

Sakib, M. H., M.S.I. Afrad and M. Ali. 2015. Information Source Preference of Farmers Regarding Modern Aquaculture Technologies in Bogra District of Bangladesh. *International Journal of Agricultural Extension*, 3(1): 01-05.

Siddique, M.N.E.A., M.A. Halim, M. Kamaruzzaman, D. Karim and J. Sultana. 2014. Comparative Insights for Investigation of Soil Fertility Degradation in a Piedmont Area which Cover the Anjamkhor Union of Baliadangi Upazila, Thakurgoan, Bangladesh. *IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)*, 8(4): 82-87.

Vanlauwe, B., K. Descheemaeker, K.E. Giller, J. Huising, R. Merckx, G. Nziguheba, J. Wendt and S. Zingore. 2015. Integrated soil fertility management in sub-Saharan Africa: unravelling local adaptation. *SOIL*, 1, 491–508.