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A STUDY ON SOCIAL NETWORK ATTRIBUTES AMONG FARMERS

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ABSTRACT

There remains hardly any dimension in agriculture which is unaffected by climate change. It is noteworthy to study on farmers networks and critically analyze how the network relationships help to impede the climate related issues and promote climate smart practices. Purpose behind studying Social Networks is understanding how farmer networks enhances in discerning the mechanism of information flow and promote such information in adoption of Climate Smart Agricultural Practices (CSAPs). Study area includes six adopted villages of CPGS-AS, CAU-I and ICAR RC for NEH Region i.e., Lairkhla, Khweng, Mawbri, Kdonghulu, Thadnongiaw and Palwi of Ri-Bhoi district of Meghalaya. The present study focuses on documenting their socio-personal and psychological characteristics and how these variables correlate with the social network attributes among Mera Gaon Mera Gaurav beneficiary farmers in Ri-Bhoi district of Meghalaya. 'Homophily' had positive and high statistical significant correlation with 'Age' and had very high negative statistical significant correlation with 'Adoption Behaviour of CSAPs' of the respondents having Spearman's rho value of 0.820 and –0.941at p =0.046 and 0.004 respectively. Indicating that novelty on CSAPs did not disseminate nimbly in a homophilous ISN of the respondents. 'Annual Income' had positive and perfect statistically significant with 'Farming Experience' of the respondents having Spearman's rho value of 1.000 at p = 0.001

Keywords: *socio-psychological characteristics, informal social networks attributes, correlogram*

INTRODUCTION

Agriculture remains as an increasingly impressive sector for endorsing global food and nutritional security for a projected population of approximately 9 billion by 2050, necessitating a 70–100 per cent increase in agricultural production under conditions of diminishing natural resources and increasing climatic variability (Godfray et al., 2010). Simultaneously, climate change has emerged as a major systemic risk to agricultural sustainability, with India ranked fifth among the most climate-vulnerable countries according to the Global Climate Risk Index (CRI)–2020. Projections indicate that by 2050, nearly 9 billion people may experience deteriorating living standards, with poverty, food insecurity, and malnutrition intensifying due to compounded socio-economic and environmental stresses (FAO, 2013). The Intergovernmental Panel on Climate Change highlights that rising temperatures (by 1.5–2°C), erratic precipitation patterns, and augmented frequency of exciting climatic events are already exerting significant negative impacts on crop yields, livestock productivity, and overall farming system resilience. Developing economies are particularly vulnerable due to structural constraints such as low capital formation, limited technological penetration, weak institutional frameworks, and inadequate risk-buffering mechanisms (Mekonnen, 2018; Vinaya & Gadde, 2025). Empirical evidence suggests that a 1°C increase in temperature can reduce yields of major cereals like wheat by 6–10 per cent, while rainfall variability can lead to yield fluctuations of up to 20–30 per cent in rainfed systems (Singh et al., 2017).

In this milieu, Climate-Smart Agriculture (CSA) has been conceptualized as an integrative and adaptive framework for changing agricultural systems to accomplish sustainable intensification under climate change scenarios (Lipper et al., 2014). CSA is structured around three interdependent pillars: (i) enhancing agricultural productivity and farm incomes through resource-use efficiency, (ii) strengthening adaptive capacity and resilience to climatic stresses, and (iii) mitigating greenhouse gas (GHG) emissions through low-carbon agricultural pathways (Vinaya et al., 2025). Globally, agriculture supports the livelihoods of nearly 2.5 billion people, with approximately 75 per cent of the world's poor residing in rural areas and depending directly on agriculture for income and subsistence. The socio-economic profile of farmers including age, education, gender, landholding size, and annual income plays a pivotal role in shaping the adoption and diffusion of CSA technologies. Farm income levels significantly influence investment capacity in climate-resilient technologies, often constrained by liquidity shortages and high transaction costs. These farmers frequently experience substantial "yield gaps," often ranging between 30–60 per cent for major crops, defined as the difference between potential and realized yields under existing management conditions (Reardon, 2009). Bridging these yield gaps requires a combination of technological interventions, institutional support, and enhancement of farmers' knowledge systems.

Knowledge of CSA practices is a critical determinant of adoption behaviour, encompassing awareness of stress and drought tolerant crop varieties, conservation agriculture, integrated nutrient and water management, agroforestry, and climate-resilient livestock systems. Communication variables such as extension contact, access to mass media, participation in farmer field schools, and use of digital platforms significantly enhance information dissemination and reduce knowledge asymmetry (Kalasariya et al., 2022). Farmers with frequent extension interactions (more than 10 contacts per year) demonstrate significantly higher adoption rates of CSA practices. Both formal (extension agencies, research institutions) and informal (peer networks, progressive farmers) communication channels play a vital role in shaping decision-making processes. Higher interaction with extension agents and progressive farmers led to better decision-making and increased adoption levels (Chaudhary et al., 2021). Socio-psychological traits like innovativeness, risk orientation, and scientific orientation significantly affected adoption behaviour (Solanki and Patel 2018). Psychological attributes further influence technology adoption, with variables such as innovativeness, risk orientation, scientific orientation, achievement motivation, and perception of climate risk being critical determinants. Farmers exhibiting higher innovativeness and risk-bearing capacity are early adopters of CSA practices, while those with strong achievement motivation and favourable attitudes towards sustainability are more likely to sustain adoption over time. Perception of climate variability and risk awareness also significantly influence adaptive behaviour, as farmers who perceive higher climatic risks are more inclined to adopt resilience-enhancing strategies.

To report the antagonistic effects of climate change, the development and implementation of robust adaptation strategies are imperative (Fawzy et al., 2020). Evidence suggests that adaptation interventions such as crop diversification, integrated farming systems, water harvesting, and climate-resilient infrastructure can enhance farm income by 15–25 per cent and reduce yield variability by 20–30 per cent (Fedele et al., 2019). Strengthening input delivery systems and extension services ensures timely access to quality inputs, including drought- and heat-tolerant crop varieties, improved livestock breeds, and resilient fishery and forestry species. Livestock systems, contributing nearly 40 per cent of agricultural GDP in developing countries, serve as a critical buffer against climate-induced income shocks. Effective livestock management requires access to technical knowledge on feed efficiency, disease management, and dairy value addition (Shukla et al., 2024).

OBJECTIVES

(1) To document the Socio-personal, economic, communication and Socio-psychological characteristics of MGMG beneficiary farmers.

(2) To map the correlation between Informal Social Network attributes with behavioural characteristics of farmers on adoption of CSA Practices.

METHODOLOGY

The study was conducted in the Umsning Community and Rural Development Block of Ri-Bhoi district of the state Meghalaya, in which agriculturally important villages had been adopted under MGMG by both the institutes of CPGS-AS and ICAR RC for NEH Region, was selected purposively in the scientific study. Out of the 21 adopted villages of Umsning CRDB under MGMG by the CPGS-AS, three most agriculturally important villages namely, (1) Lairkhla, (2) Khweng (3) Palwi; as well as three utmost agriculturally significant villages out of 16 adopted villages of Umsning under MGMG by the ICAR RC for NEH Region namely (4) Thadnongiaw, (5) Kdonghulu (6) Mawbri had been purposively selected for the scientific interrogatory. The contemporary work is an exploratory and diagnostic study in which a key farmer (contact farmer) who strictly followed CSAPs was identified in each of the selected villages and through snowball sampling technique, nine other farmers from the respective villages had been selected in order to constitute ten (10) farmer respondents from each village. Thus, a sample size of sixty respondents (n=60) had been constituted for the study. Peers and Kinship groups play a vital role in information dissemination among the networks, Nevertheless, the socio-economic and socio-psychological characters contribute evenmore in disseminating information

RESULTS AND DISCUSSIONS

1. To document the Socio-personal, Socio-economic, Socio-communication and Socio-psychological characteristics of MGMG beneficiary farmers of Ri-Bhoi district.

Table.1: Socio-personal, Socio-economic, Socio-communication and Socio-psychological characteristics of farmers

(n=60)

Sr. No:	Variable	Categories	Frequency	Percentage
A	*Cause variables*			
a	*Socio-personal variables*			
1	Age	Young Age (< 35 yrs.)	4	6.66
		Middle Age (35-50 yrs.)	51	85.00
		Old Age (>50 yrs.)	5	8.34
2	Gender	Male	23	38.30
		Female	37	61.70
3	Education	No Formal Education	3	5.00
		Primary Education	28	46.70
		Secondary Education	24	40.00
		Under-Graduate	5	8.30
b	*Socio-economic variables*			
4	Operational Land Holding	Small Farmer (0.05- 4.00 ha)	37	61.67
		Medium Farmer (> 4.00-10.00 ha)	15	25.00
		Large Farmer (>10.00 ha)	8	13.33
5	Annual Income	Low (≤₹ 89000)	31	51.67
		High (>₹ 89000)	29	48.33
c	*Socio- communication variables*			
6	Mass Media Access	Low (≤22.5 score)	35	58.33
		High (>22.5 score)	25	41.67
d	*Socio-Psychological variables*			
7	Farming experience	Low (1-10 years)	10	16.66
		Medium(11-20years)	41	68.34
		High (21-30 years)	9	15.00
8	Knowledge on CSA Practices	Low (≤ 6 score)	53	88.34
		High (> 6 score)	7	11.66
B	*Effect variable*			
1	Adoption Behaviour of CSA Practices	Low (K-Cluster Mean = 84)	36	60.00
		Medium (K-Cluster Mean = 126)	15	25.00
		High (K-Cluster Mean = 190)	9	15.00

Table.1 revealed that 85.00% of total respondents were in middle age group in the range of 35-50 years. Interestingly, it reflected that female farmers with percentage of around sixty-two per cent (61.70%) engaged in agricultural activities. Highest percentage of 46.70% followed by 40.00% and very low percentage of 8.30% acquired educational qualification of Primary, Secondary and Under-Graduate. However, 5.00% of respondents had no formal education. Majority of respondents, say 61.67% followed by 25.00% and 13.33% of respondents possessed Small (0.05- 4 Ha), Medium (> 4-10 Ha) and Large (> 10 Ha) of operational land holding for agriculture. Because the farmers involved in agricultural activities have fragmented lands all over the block and district. It was observed during the personal field visit that fragmentation of agricultural land ownership had tremendously spiked due to increase in population in the adopted villages of MGMG. Hence, it could be narrated that just above fifty (51.67%) say majority respondents had low level (≤ ₹89,000/-) annual income. From the interactions with farmers it can be described that majority of respondents, 68.33% had medium farming experience on CSAP. Majority of about fifty-eight per cent (58.33%) of respondents had high 'Mass Media Access'. From the table 1, it revealed that very high percentage (88.34%) of the respondents possessed low

'Knowledge on CSAPs', the measuring variable 'Adoption Behaviour of CSA Practices' with a clear demarcation using K- Cluster Mean of values 84, 126 and 190 revealed that most of the respondents (60.00%) have low Adoption Behaviour of CSA Practices.

2. To analyze correlation among Informal Social Network attributes with individual behavioural characteristics of beneficiary farmers on adoption of CSA Practices

Table 2 : Spearman's Correlations amongst Informal Social Network attributes with individual behavioural characteristics of beneficiary farmers on adoption of CSA Practices

Variable		CENT	COHE	TIES	HOMO		AGE	GEN	EDU	OLH	AI		FE	MMA	KCSA	ADB
1. CENT	Spearman's rho	—														
	p-value	—														
2. COHE	Spearman's rho	0.657	—													
	p-value	0.156	—													
3. TIES	Spearman's rho	NaN	NaN	—												
	p-value	NaN	NaN	—												
4. HOMO	Spearman's rho	-0.230	-0.647	NaN	—											
	p-value	0.662	0.165	NaN	—											
5. AGE	Spearman's rho	0.093	-0.135	NaN	**0.820**	*	—									
	p-value	0.862	0.798	NaN	**0.046**		—									
6. GEN	Spearman's rho	0.424	0.775	NaN	-0.417		0.131	—								
	p-value	0.402	0.070	NaN	0.410		0.805	—								
7. EDU	Spearman's rho	0.730	0.000	NaN	0.180		0.169	0.000	—							
	p-value	0.099	1.000	NaN	0.733		0.749	1.000	—							
8. OLH	Spearman's rho	0.185	-0.338	NaN	0.516		0.314	-0.655	0.338	—						
	p-value	0.725	0.512	NaN	0.295		0.564	0.158	0.512	—						
9. AI	Spearman's rho	-0.062	-0.372	NaN	0.577		0.600	-0.131	0.169	0.543	—					
	p-value	0.908	0.468	NaN	0.231		0.242	0.805	0.749	0.297	—					
10. FE	Spearman's rho	-0.062	-0.372	NaN	0.577		0.600	-0.131	0.169	0.543	**1.000**	**	—			
	p-value	0.908	0.468	NaN	0.231		0.242	0.805	0.749	0.297	**0.001**		—			
11. MMA	Spearman's rho	-0.016	0.309	NaN	-0.493		-0.435	-0.133	-0.429	0.290	0.058		0.058	—		
	p-value	0.977	0.552	NaN	0.321		0.389	0.802	0.396	0.577	0.913		0.913	—		
12. KCSA	Spearman's rho	0.741	0.778	NaN	-0.273		0.143	0.393	0.169	0.314	0.086		0.086	0.522	—	
	p-value	0.092	0.069	NaN	0.600		0.803	0.441	0.749	0.564	0.919		0.919	0.288	—	
13. ADB	Spearman's rho	0.216	0.541	NaN	**-0.941**	**	**-0.886**	0.131	-0.169	-0.257	-0.600		-0.600	0.638	0.314	—
	p-value	0.681	0.268	NaN	**0.005**		**0.033**	0.805	0.749	0.658	0.242		0.242	0.173	0.564	—
NaN (Not a Number): The variance in TIES is equal to 0																
* p < .05, ** p < .01, *** p < .001																

'CENT = Centrality', 'COHE = Cohesiveness', 'TIES = Ties', 'HOMO = Homophily', 'GEN = Gender', 'EDU = Education', 'OLH = Operational Land Holding', 'AI = Annual Income', 'FE = Farming Experience', 'MMA = Mass Media Access', 'KCSA = Knowledge on CSA Practices' and 'ADB = Adoption Behaviour of CSA Practices'

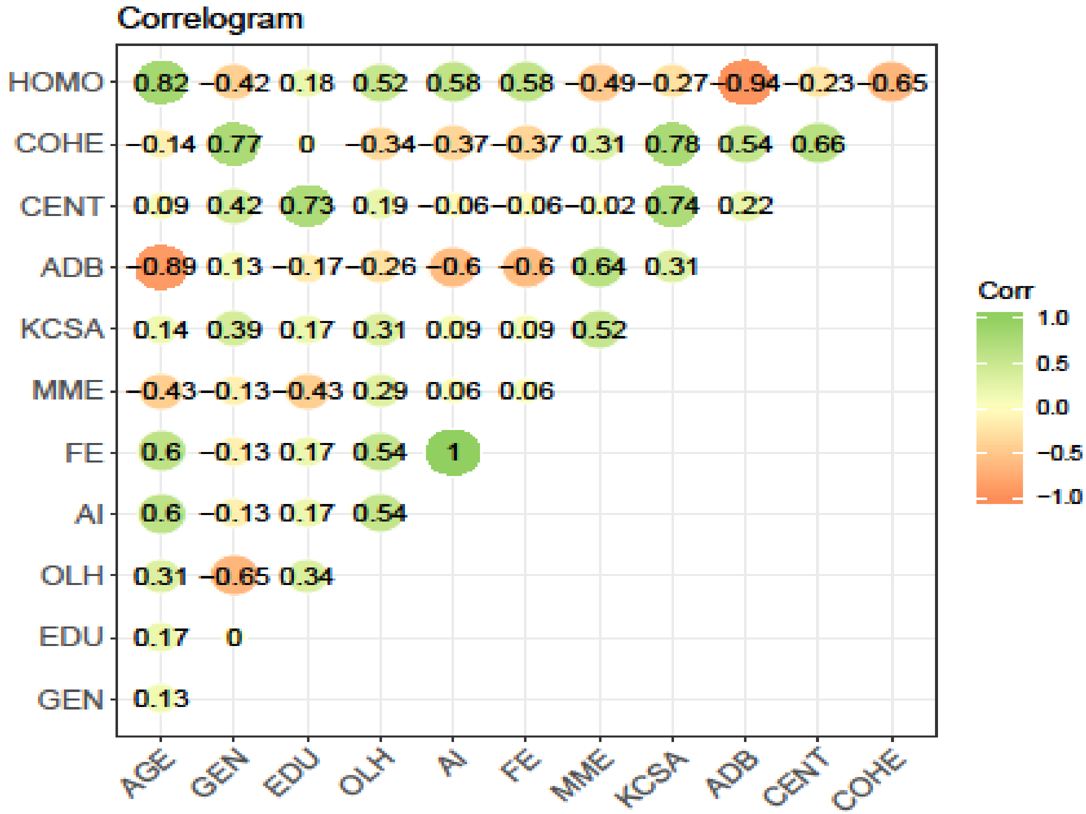

Figure 1: Spearman's rho correlogram

The study had accentuated in administering Spearman Rank-Order Correlation analysis in order to examine the relationship of informal social network attributes namely 'Centrality', 'Cohesiveness' and 'Homophily' with socio-economic and behavioural characteristics of beneficiary farmers *viz.,* 'Age', 'Gender', 'Education', 'Operational Land Holding', 'Annual Income', 'Farming Experience', 'Mass Media Access', 'Knowledge on CSA Practices'

Construing the data in Table 2 and Spearman's rho Correlogram of Figure 1, it could be narrated that the informal social network attribute namely 'Homophily' had positive and high statistically significant correlation with 'Age' of the respondents having Spearman's rho value of 0.820 at p = 0.046, hinting that similar age group of the respondents who were in middle age category were having analogous and complementary mindset or level of knowledge on CSAPs. Similarly, the same attribute 'Homophily' had very high negative statistically significant correlation with 'Adoption Behaviour of CSAPs' having Spearman's rho value of –0.941at p = 0.004, indicating that novelty on CSAPs did not disseminate nimbly in a homophilous ISN of the respondents. Further, it could be observed that 'Annual Income' had positive and perfect statistically significant correlation with 'Farming Experience' of the respondents having Spearman's rho value of 1.000 at p = 0.001, hinting that as the farming experience of respondents advances the annual income also forwards even in quandary of climate change impacts in agriculture by implying CSAPs. Similar findings were reported in scientific study of Ville (2013), Agarwal *et al.* (2017), Rathod and Chauhan (2019), Patel and Desai (2020), Vekariya and Patel (2022) and in contradiction to the findings of Schmitt *et al*. (2013) and Contractor and De Church (2014); Rathwa *et al.* (2024); Tadavi *et al.* (2024); Tadepalli *et al.* (2024); Anusha *et al.* (2023); Chauhan *et al.* (2016); Pratik & Vinaya, (2021).

CONCLUSION

A critical finding of the study is the low level of knowledge regarding CSAPs among the majority of respondents, despite moderate access to mass media and extension services. This indicates a gap between information availability and effective knowledge transfer. Informal social networks, particularly attributes like centrality and cohesiveness, were found to play a facilitative act in enhancing awareness and adoption. However, homophily exhibited a negative association with adoption behaviour, suggesting that highly homogeneous groups may limit the diffusion of innovative practices due to restricted exposure to diverse information sources. The correlation analysis further reveals that behavioural characteristics such as farming experience and annual income are positively associated, indicating that experienced farmers tend to achieve better economic outcomes, even under climatic stress conditions. Nevertheless, the persistence of low adoption levels underscores the need for targeted interventions focusing on capacity building, strengthening extension systems, and promoting inclusive communication strategies. Overall, the study emphasizes that improving farmers' knowledge, leveraging key actors within social networks, and reducing informational barriers are essential for accelerating the adoption of CSAPs. Policymakers and extension agencies must prioritize participatory approaches and network-based dissemination strategies to ensure sustainable agricultural development and resilience in the aspect of climate change.

RECOMMENDATIONS

a. Understanding the spread of diffusion among homophilous networks spotlight on the groups to identify the homophilous and heterophilous groups in district

b. This study gives a map of the correlational analysis of networking attributes with the socio-economic characteristics of farmers

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CONFLICT OF INTEREST

I hereby state that there are no conflicts of interest within the research team.

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