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RESEARCH ARTICLE

Sustainable Livelihood Empowerment Status of Rural Stakeholders Under Faremers Farm, Innovation, Resources, Science and Technology Project of Indian Council of Agricultural Research in Nadia District of West Bengal, India

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ABSTRACT

The present study entitled "*Sustainable Livelihood Empowerment Status of Rural Stakeholders under Farmer FIRST Project of ICAR in Nadia District of West Bengal*" was undertaken to assess the livelihood empowerment level of farming communities across three adopted villages, that is, Ayeshpur, Baksh, and Dakshin Duttapara under Haringhata Block of Nadia district, West Bengal. A comprehensive field survey was conducted during March 2025, covering 1001 farmers engaged in livestock-Poultry, horticulture and fishery-based enterprises. Data were collected using a structured interview schedule focusing on socioeconomic indicators, livelihood assets, income generation, technology adoption, and social participation. The analysis revealed significant role of livelihood capitals i.e. human, social, financial, physical and natural among the participating farmers for implementing the interventions under Farmer Farm, Innovation, Resources, Science and Technology (FIRST) project of Indian Council of Agricultural Research at West Bengal University of Animal and Fishery Sciences West Bengal University of Animal and Fishery Sciences. Enhanced access to training, improved production practices, diversified income sources and institutional linkages should contribute to increased household income and resilience. The animal Husbandry farmers have effective income and women's participation, while horticulture and fishery stakeholders followed improved input management and market linkages. Overall, the findings indicated that the Farmer FIRST project interventions will effectively promoted sustainable livelihood empowerment and inclusive rural development in the target villages. The study emphasizes the importance of participatory technology dissemination, capacity building and enterprise diversification for strengthening livelihood security of small and marginal farmers in functional area of the study in the state of West Bengal, India.

Key words: Empowerment, farmer farm, innovation, resources, science and technology, livelihood, stakeholders, sustainable

INTRODUCTION

Animal husbandry-based livelihoods play a pivotal role in strengthening the rural economy of India, particularly among small and marginal farming communities. In West Bengal, animal husbandry and allied activities have emerged as key livelihood options that ensure nutritional security, supplementary income and year-round employment. However, the socioeconomic upliftment and livelihood empowerment of rural stakeholders largely depend on the effective

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adoption of sustainable livestock practices, access to institutional support, and availability of need-based technological interventions. In this context, the Indian Council of Agricultural Research (ICAR), Government of India, launched the Farmers farm, innovation, resources, science and technology (FIRST) project to promote farmer-centric, participatory, and climate-smart interventions.

The present study focuses on the socioeconomic and livelihood empowerment status of beneficiaries engaged in animal husbandry and allied activities in three adopted villages, that is, Ayeshpur, Baksha, and Dakshin Duttapara under Haringhata Block in Nadia district, West Bengal, as implemented through Department of Veterinary and A.H. Extension Education, WBUAFS, Kolkata. The investigation assesses how Farmers FIRST interventions will be implemented and influence livelihood capital, income diversification, resource utilization, and sustainable livestock management in the adopted area. The findings aim to generate evidence-based insights for enhancing field extension strategies, strengthening rural livelihoods and promoting inclusive livestock and allied farming development in the area.

MATERIALS AND METHODS

The present study was conducted under the Farmers FIRST project of ICAR, Government of India to assess the socio-economic and livelihood empowerment status of rural stakeholders engaged in animal husbandry and allied activities. A baseline survey was carried out in three adopted villages, that is, Ayeshpur ($n = 422$), Baksha ($n = 319$) and Dakshin Duttapara ($n = 260$) villages under Haringhata Block in Nadia district, West Bengal, covering a total of 1001 respondents selected through random sampling methods of study. A structured and pre-tested interview schedule was used to collect primary data on demographic features, livelihood capitals, income patterns, resource availability and constraints related to livestock farming. Personal interviews and field observations were employed to ensure the accuracy and reliability of responses. The collected data were systematically coded and tabulated for analysis. Descriptive statistical tools such as frequency and percentage were used to summarize socioeconomic characteristics and livelihood indicators of the sample households. For inferential analysis, correlation techniques were applied to examine the relationship between selected socioeconomic variables and perceived constraints or empowerment dimensions using the Statistical Package for the Social Sciences 25 software for an effective interpretive study (Field A, 2013). The results were interpreted to draw meaningful conclusions on the effectiveness of existing livelihood practices and scope for sustainable animal husbandry interventions.

RESULTS AND DISCUSSION

Table 1 Socio-demographic profile of sample respondents in adopted villages (03) under Haringhata block, Nadia District of West Bengal is as follows.

The socioeconomic assessment of 1,001 respondents from Ayeshpur, Baksha, and Dakshin Duttapara villages revealed a predominantly working-age population, with 75.3% belonging to the 26–50 year middle age category, while elderly and young respondents constituted 22.5% and 2.2%, respectively. This demographic structure represents a favorable human capital base, as a higher proportion of economically active individuals enhance the potential for technology uptake and labor availability in livestock-based enterprises (FAO, 2009; Swanson, 2008). The sample was male-dominated (84.3%), suggesting male-centric decision-making in livelihood activities and reflecting the gendered pattern of agricultural labor allocation in the functional area (Agarwal, 2018). However, the under-representation of women (15.7%) also indicates an invisible but significant workforce in backyard livestock activities, explored the need for women-targeted training and empowerment strategies.

Low educational attainment is a critical barrier, as 49.2% of respondents were illiterate or only functionally literate. Such limited formal education restricts human capital development and may inhibit the adoption of scientific practices, record-keeping or digital livestock advisories (Chambers and Conway, 1992). Family dynamics further highlighted that 75% belonged to nuclear households with small

Table 1: Socioeconomic status and livelihood capital-based features of sample respondents in adopted villages (03) under Haringhata block, Nadia District of West Bengal

Variable	Category	Frequency	Percent	Variable	Category	Frequency	Percent
Socio-economic status information				**Livelihood capital based features**			
Age	Young (<25 year)	22	2.2	Farm power	No DA	442	44.2
	Middle (26–50 year)	754	75.3		1–2 DA	02	0.2
	Elderly (51–75 years)	225	22.5		3–4 DA	509	50.8
Gender	Male	844	84.3		TCT/PT/HV	02	0.02
	Female	157	15.7	Material possession	B. Cart	46	4.6
Religion	Hinduism	848	84.7		Cycle	54	5.4
	Muslim	137	13.7		M. cycle	582	58.1
	Christian	05	0.5		Television	308	30.8
	Others	11	1.1		4 wheel car	39	3.9
Marital status	Married	735	73.4		Imp Agril Im	18	1.8
	Unmarried	149	14.9	Gross family income	<Rs. 2000/-	514	51.3
	Divorced	48	4.8		Rs. 2001–5000	487	48.7
	Widow	66	6.6	Annual IncomeV Sour	Agriculture	510	50.9
	Widower	03	0.3		AH-Fishery	491	49.1
Occupation	Farmer	264	26.4	Land holding	Landless	73	7.3
	Lives/Fish Owner	198	19.8		Marginal	422	42.2
	Agriculture labor	83	8.3		Small	441	44.1
	Skill/unskill labor	404	40.4		Semi-Medium	37	3.7
	Service	04	0.4		Medium	28	2.8
	Business	30	3.0	Agril crops	No crop	175	17.5
	Self-Employed	12	1.2		one crop	805	80.4
	Unemployed	06	0.6		>One crop	21	2.1
Caste	SC	242	24.2	Horti crops	No crop	698	69.7
	ST	175	17.5		One crop	301	30.1
	OBC	111	11.1		>One crop	02	0.2
	General caste	473	47.3	Recommend practice followed	No	642	64.1
Education of the respondents	Illiterate	258	25.8		Yes	359	35.9
	Can read only	234	23.4	Scientific storage	No	736	73.5
	Can read and write	180	18.0		Yes	265	26.5
	Primary	193	19.3	Market facility	No	709	70.8
	Middle	121	12.1		Yes	292	29.2
	High school	05	0.5	Remunerative price	No	751	75.0
	Graduate and above	10	1.0		Yes	250	25.0
Family type	Nuclear	751	75.0	Fertilizer used	No	291	29.1
	Joint family	250	25.0		Yes	710	70.9
Family size	Small (<5)	729	72.8	Scientific cold storage	No	734	73.3
	Medium (6-7)	207	20.7		Yes	267	26.7
	Large(>7)	65	6.5	Organized market facility	No	683	68.2
House type	No house	82	8.2		Yes	318	31.8
	Hut	221	22.1	Irrigation facility	No	299	29.9
	Kutcha house	373	37.3		STW	700	69.9
	Mixed house	91	9.1		DTW	01	0.1
	Pucca house	225	22.5		OTH	01	0.1
	Mansion	09	0.9				

family sizes, indicating constrained household labor yet potentially faster decision-making in enterprise planning. Caste heterogeneity, with 41.7% respondents from SC/ST groups, reflects diverse social capital conditions, especially concerning access to institutions, entitlements and productive assets (Pretty, 2003). The livelihood structure revealed dual dependence on agriculture (50.9%) and animal husbandry–fishery (49.1%), confirming the centrality of livestock as a complementary income source for smallholders consistent with national trends as reported by Birthal *et al*. (2005). However, household income was critically low, with 51.3% earning below ₹2,000/month and 48.7% between ₹2,001 and ₹5,000, showing high financial vulnerability and limited risk-bearing capacity, which suggests that without institutional credit, revolving funds, or input support, even willing farmers may be unable to adopt improved livestock technologies or infrastructure.

The landholding data showed 86.3% of respondents were marginal and small farmers, while 7.3% were landless. Such land fragmentation reflects a fragile natural capital base, limiting fodder cultivation, crop diversity and on-farm resource recycling. Although one-crop agriculture predominated (80.4%), horticultural diversification remained low (30.1% with one crop), indicating untapped potential for integrated farming systems (IFS). Given that integrated crop-livestock systems improve nutrient cycling, fodder availability and resilience (FAO, 2018), in project villages. Physical capital analysis highlighted that 50.8% of respondents possessed 3–4 draft animals or equivalent farm power, a substantial 44.2% reported none. Material assets such as motorcycles (58.1%) and televisions (30.8%) indicate moderate household mobility and information exposure. However, housing conditions revealed that 59.4% lived in kutcha or hut-type dwellings, reflecting structural vulnerability. Critical infrastructure deficits were observed in value-chain enablers, where only 26.5% reported access to scientific storage, 26.7% to cold storage, 29.2% to market facilities and 25% to remunerative pricing. These findings emphasize that while production-level capacities exist, post-production and value-addition infrastructure remain weak, constraining income growth from livestock and other farm-based products. This aligns with DFID's (1999) view that physical capital limitations directly suppress livelihood diversification and value realization. The evidence supports livestock as an engine of livelihood empowerment, but only when supported by market linkage, credit, extension and infrastructure interventions in the area.

Table 2 social livelihood capital and communication source-based features of respondents in three adopted villages of Haringhata Block, Nadia District of West Bengal.

The social capital and access to communication networks are key determinants of livelihood empowerment and technology adoption in rural development programs (Chambers, 1994; DFID, 1999). Within the Farmers FIRST framework, social participation, decision-making power, and access to formal as well as informal communication channels significantly influence farmers' capability to utilize interventions for sustainable animal husbandry practices. The present analysis evaluates the respondents' social livelihood capital and communication exposure patterns to understand their developmental readiness.

Social-Livelihood Capital Analysis

The findings revealed that a major part of respondents (72%) did not participate in any social organization, indicating weak institutional linkages at the community level. Only 28% reported membership in at least one group, reflecting low social capital, which can restrict collective action and farmers' bargaining strength (Putnam, 1995). Similarly, extension exposure was low, as 69.6% had never received training, and only 29.2% had attended 1–2 trainings, demonstrating limited access to capacity-building opportunities. A low level of training reduces innovation adoption and limits livelihood diversification (Rogers, 2003). Regarding decision-making, joint decision practice was the most common (43.3%), followed by husband-dominated decisions (23.6%) and no response (31.2%), suggesting a gradual shift toward participatory household decisions, which is encouraging for gender-inclusive rural development. Most respondents (89.3%) reported no migration, indicating stable rural attachment, possibly due to the anchoring role of livestock and agriculture in income security. Although 93.6% did not borrow,

Table 2: Social livelihood capital and communication source-based information of respondents in adopted villages (03) in Haringhata block, Nadia District of WB, India

Variable	Category	Frequency	Percentage	Variable	Category	Frequency	Percentage
Social livelihood capital information				**Formal sources of communications**			
Social participant	No participant	721	72.0	KVK/Extn Personnel	Never	695	69.4
	01 Member	280	28.0		Sometime	297	29.7
Extension contact	No Trg.	697	69.6		Often	6	0.6
	1–2 Trg.	292	29.2		Most Often	3	0.3
	3–4 Trg.	06	0.6	ADO/KPS	Never	295	29.5
	5 and >	06	0.6		Sometime	706	70.5
Decision making pattern	No Resp.	312	31.2	BLDO/VO	Never	850	84.9
	Husband	236	23.6		Sometime	151	15.1
	Collective	20	2.0	Fish extn officer	Never	874	87.3
	Jointly	433	43.3		Sometime	127	12.7
Migration status	No	894	89.3	Bank/PRI Person	Never	352	35.2
	Yes	107	10.7		Sometime	649	64.8
				Input dealer/other	Never	308	30.8
Borrowing source	No	937	93.6		Sometime	243	24.3
	Yes	64	6.4		Often	450	45.0
Purpose of loan	Buy land/AH	757	75.6	**Informal sources of communication**			
	Others	244	24.4	Family member	Never	236	23.6
Access physical facility	No	295	29.5		Sometime	314	31.4
	Yes	706	70.5		Often	451	45.1
Physical facility	No	228	22.8	Relatives	Never	170	17.0
	Medical facility	308	30.8		Sometime	828	82.7
	Educational facility	429	42.9		Often	3	0.3
	Electrical facility	20	2.0	Friends	Never	286	28.6
	Other facility	16	1.6		Sometime	715	71.4
Village quality	Satisfied	534	53.3	Dairy entrepreneurs	Never	827	82.6
	Unsatisfied	423	42.3		Sometime	174	17.4
	Don't know	44	4.4				
Different mass media sources of communication							
Variable	**Category**	**Frequency**	**Percent**	**Variable**	**Category**	**Frequency**	**Percent**
Radio	Never	805	80.4	News paper	Never	272	27.2
	Sometime	161	16.1		Sometime	710	70.9
	Often	35	3.5		Often	19	1.9
Television	Never	235	23.5	Farm literature	Never	844	84.3
	Sometime	294	29.4		Sometime	151	15.1
	Often	472	47.2		Often	06	0.6

those who took loans (6.4%) mostly borrowed for land and animal husbandry a activity (75.6%), which aligns with livelihood enhancement motives. Access to physical amenities was comparatively better, as 70.5% reported access to key facilities, especially education (42.9%) and medical facilities (30.8%), which strengthens human capital. In terms of satisfaction in quality of service in the village, 53.3% were satisfied, reflecting moderately favorable physical and social environments. The overall pattern indicates moderate human capital, but weak social capital, necessitating stronger community mobilization and extension networking in the adopted area of the project.

Communication Source-based Analysis

The study explored that the formal extension linkage was noticeably limited. A large majority never contacted KVK/extension personnel (69.4%),

and only 0.6% reported frequent interaction**,** signifying low institutional communication. Contact with ADO/KPS was occasional for 70.5%, while interaction with BLDO (84.9%) and fisheries extension officers (87.3%) was minimal. Limited contact with technical personnel reduces knowledge inflow and slows technology dissemination (Rivera and Qamar, 2003). Bank and Panchayat personnel were contacted "sometimes" by 64.8%, showing relatively better access to governance structures. Interestingly, input dealers served as a major formal-informal hybrid source, with 45% reporting frequent contact. This aligns with the Indian context, where agri-input dealers often act as accessible advisory agents (Swanson, 2008).

Informal channels were dominant in the communication ecology. Family members (45.1% frequent contact), relatives (82.7% occasional contact), and friends (71.4% occasional contact) were the most trusted communication sources. Although informal networks ensure quick information flow through trust and proximity, they often transmit experience-based, not science-based, knowledge (Rogers, 2003). Contact with Dairy entrepreneurs was largely absent (82.6%), which indicates untapped potential for peer-led extension. Television emerged as the most effective mass-media tool, with 47.2% regular viewers and 29.4% occasional users, positioning TV as a strong medium for ICT-enabled extension. Radio exposure was negligible (80.4% never listened), reflecting its declining influence. Newspaper readership was moderate (70.9% sometime), while farm literature had very low reach (84.3% never used), indicating the need for more farmer-friendly printed extension material.

The results clearly show a "*high informal low formal communication model*," which is typical of rural India (Rogers, 2003). Weak social capital and limited extension exposure constrain livelihood transformation, even, when physical and human capital exist (DFID, 1999). Thus, capacity building, farmer groups and ICT-rich extension are essential for improving livestock-based livelihoods.

Correlation coefficient analysis between selected socio-economic, livelihood capital features and perceived constraints in relation to animal husbandry and allied livelihood practices by respondents in the study area under Nadia District of W.B [Table 3].

The correlation values indicate that the education of respondents is negatively and significantly correlated with all categories of perceived constraints (e.g., r = −0.084–−0.196, $P < 0.01$). This implies that educated respondents experience fewer constraints, likely due to better information processing ability, higher awareness, and confidence in adopting scientific practices. Similar findings were reported by Rivera and Qamar (2003), emphasizing the role of human capital in overcoming livelihood barriers. Family size shows a positive correlation with overall perceived constraints (r = 0.370, $P < 0.01$), suggesting that larger households experience greater livelihood pressure and resource burden, making it difficult to adopt improved technologies. Age shows very weak correlations, indicating that constraints are influenced more by knowledge and resources than by age. Landholding also shows weak correlations, demonstrating that farm size alone does not eliminate constraints unless supported by extension and communication capital.

A strong and statistically significant negative correlation is observed between formal communication, informal communication, mass media exposure, and overall communication score with all constraints (r = −0.343–−0.742, $P < 0.01$). This confirms that households with better access to KVK, extension personnel, input dealers, or information media face fewer livelihood constraints. This finding aligns with Rogers' Diffusion of Innovations Theory, which highlights communication exposure as a key determinant of technology adoption and problem-solving behavior (Rogers, 2003). Mass media and informal communication exhibit particularly strong associations, suggesting that rural farmers still rely heavily on television, friends and family networks for livelihood decision-making. Strengthening communication capital, therefore, becomes a strategic extension priority to reduce constraints in livestock-based livelihoods. The correlation results show that gross family income and annual income from multiple sources have strong, significant, and negative correlations with perceived constraints(r = −0.756–−.799, $P < 0.01$). Higher-income families are more capable of purchasing inputs, accessing services, investing in diversification, and coping with risk, and therefore perceive fewer constraints. This supports the logic of the Sustainable Livelihoods Framework

Table 3: Correlation co-efficient between selected socio-economic and livelihood capital features and perceived constraints in relation to animal husbandry and allied livelihood practices by respondents in study area under Nadia District of West Bengal

Variable	Age	Edun of respondent	Family size	Land holding	Formal common	Informal communication	Mass media source	Overall communication sources	Gross family income	Annual income 4 m various source	Constraint lives-Poultry and fish farm	Constraint on Horticulture and NRM	Constraint on IFS and OTH ONV farming	Overall Constant Farm Livelihood Practice
Age	1.000													
Educn of the respondent	−0.127**	1.000												
Family size	−0.021	0.169**	1.000											
Land holding	0.088**	−0.254**	0.023	1.000										
Formal common	0.044	−0.211**	−0.313**	−0.055	1.000									
Informal communion	0.055	−0.206**	−0.334**	−0.058	0.765**	1.000								
Mass media source	0.035	−0.211**	−0.307**	−0.026	0.804**	0.843**	1.000							
Overall commun. sources	0.046	−0.230**	−0.360**	−0.047	0.917**	0.935**	0.923**	1.000						
Gross family income	0.082**	−0.209**	−0.403**	−0.030	0.772**	0.772**	0.781**	0.833**	1.000					
Annual income 4 m varius source	0.065*	−0.190**	−0.361**	−0.001	0.703**	0.819**	0.772**	0.825**	0.756**	1.000				
Constraint on Live−Poultry Fish	−0.033	−0.084**	−0.222**	−0.065*	0.343**	0.457**	0.457**	0.438**	0.420**	0.542**	1.000			
Constraints on Horti and NRM	0.053	−0.009	0.050	−0.017	−0.059	−0.189**	−0.178**	−0.155**	−0.116**	−0.208**	−0.492**	1.000		
Constraint on IFS and other CF	0.082**	−0.192**	−0.368**	−0.019	0.641**	0.736**	0.670**	0.742**	0.799**	0.786**	0.514**	−0.100**	1.000	
Overall constraint on farm livelihood	0.076*	−0.196**	−0.370**	−0.028	0.641**	0.699**	0.649**	0.716**	0.771**	0.765**	0.552**	0.082**	0.959**	1.000

N.B.*(p>0.05) Significant at 5% level of significance, **(p>0.01) Significant at 1% level of significance

that economic capital directly enhances adaptive capacity (DFID, 1999; Ellis, 2000).

The three perceived constraint domains are significant and intercorrelated. The perceived constraints related to IFS and other conventional farming show a very high positive correlation with overall livelihood constraints ($r = 0.959$, $P < 0.01$), indicating that IFS-related challenges are central to the farm livelihood stress in the study area. Similarly, constraints related to Livestock–Poultry–Fishery ($r = 0.552$) showed a moderate positive association, whereas horticulture and NRM constraints show weaker and mixed correlations**,** implying that respondents perceive livestock-related challenges more critically than crop-based ones. Overall, education, communication capital, and income act as constraint-reducing variables**,** while large family size and weak communication linkages act as constraint-heightening variables**.** This confirms that strengthening human capital, economic capital, and communication capital is the most effective pathway for minimizing livelihood constraints and enhancing empowerment in livestock and allied rural farming systems under Farmers FIRST project in the adopted area.

CONCLUSION

The comprehensive socioeconomic and livelihood capital assessment reveals a workforce ready for enterprise expansion but constrained by low literacy, marginal landholding, poor infrastructure, and weak financial capital. Therefore, animal husbandry interventions under Farmers FIRST must move beyond input support and incorporate value-chain development, producer collectivization, gender inclusion, and skill-based capacity building to ensure sustainable livelihood empowerment in the adopted villages. The analysis highlights moderate livelihood readiness, but weak social and communication capital among respondents. Hence, strengthening institutional linkages, increasing training exposure, and improving communication through KVKs, mass media, and farmer groups can significantly accelerate sustainable livestock-based livelihood empowerment. The study finally explores that various extension interventions should therefore prioritize knowledge dissemination, financial support, and targeted capacity building to enhance adoption and sustainable livelihood outcomes in the functional area.

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