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Article

Role of Farmer Information and Advice Center in Providing Extension Services to Smallholder Farmers: Lessons from Bangladesh

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Abstract: The Farmer Information and Advice Centers (FIACs) are currently working to provide one-stop agricultural advisory services, including climate-friendly agriculture, to farming communities in rural Bangladesh, but their role has yet to be explored. Therefore, the aim of this study is to assess the role of FIACs in providing need-based extension services to the farming communities to create social innovation through transforming smallholders' agriculture into a farm business in rural Bangladesh. This study was conducted in Kishoreganj district, Bangladesh. The data were collected by questionnaire survey, semi-structured interviews, and focus group discussions (FGD). Both quantitative and qualitative (Trajectory Equifinality Model, TEM) analysis was applied based on the data obtained. It was found that the local FIAC approaches give farmers easy access to improved agricultural technologies. It is a needs-based service for farming households to improve their farming practices and livelihoods. Second, their resource use efficiency has increased, and their agriculture has diversified. This has improved institutional access on the ground and farmers feel empowered. So, we can call it social innovation. Third, FIAC interventions help farmers to develop farm business. Finally, farmer characteristics such as gender, farm size, farming experience, household income, and local institutional access are significantly positively related to access to FIAC services. Therefore, our policy implications suggest that FIAC should offer a gender-sensitive service approach. However, farmers faced some difficulties in obtaining services from FIAC, they needed more competent staff and female staff.

Keywords: Farmer Information and Advice Center; agricultural extension services; rural innovation; Bangladesh; farm business development

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1. Introduction

1.1. Background and Rationale of the Study

The majority of the poor live in rural areas worldwide. More than 60% of them live on subsistence farming. Most of them are small farmers and contribute about 80% to the world's food supply (Food and Agriculture Organization of the United Nations [FAO], 2014). Although agricultural productivity increases, it faces greater challenges from the impacts of global climate change (Rahman et al., 2022). In some regions of Bangladesh, farmers are producing more, while at the same time, poverty is increasing (Rana et al., 2022a). In addition, most of farmers (83.38%) are small farmers with farm sizes of less than 2.5 acres (Bangladesh Bureau of Statistics [BBS], 2021) in Bangladesh. Hence, it is very difficult for the farming community to meet the challenges with their limited resources. Thus, to reduce rural poverty, farming must be turned into a profitable business. Therefore, social innovation is necessary to address the issue. Because social innovation is viewed as a new process or product or service that meets social needs and overcomes problems

inherent in society through the integration of organizations and the empowerment of local communities in a contextual manner (Moulaert & MacCallum, 2019).

Agricultural development in the rural regions is not possible without paying attention to the development of agriculture as an industry to diversify the rural economy (Kiminami & Kiminami, 2017). Furthermore, innovations are the main drivers for creating opportunities. Market-creating innovations have the power to change the culture of society along with economic growth (Christensen et al., 2019). In this case, agricultural extension services play an important role in the rural and agricultural development paradigm through creating innovations (Biswas et al., 2021). According to Torre et al. (2020) the different agencies also played a vital role in creating social innovation in different dimensions in rural Europe. At present 1621 Farmers' Information and Advice Centers (FIAC) have been established in the different regions of Bangladesh (Agricultural Information Service [AIS], 2022) to provide need based agricultural extension services to the farming communities at the grass-root level to transform subsistence farming into a farm business. However, the role of these FIAC centers in the farm business development of small farmers in view of sustainable rural and agricultural development in Bangladesh has yet to be explored. Therefore, the main purpose of this study is to assess the role of FIACs in creating social innovation through transforming smallholders' agriculture into a farm business towards sustainable agricultural and rural development in Bangladesh.

In the study area, it was empirically analyzed that entrepreneurship and social innovation play a significant role in regional development (Rana et al., 2022a). FIACs are established in rural areas of Bangladesh with the aim of increasing the country's agricultural productivity and improving farmers' livelihoods. The center also provides advice on market information and access to credit, as well as linking farmers to government services and programs. In addition to providing information and advice, FIACs also serve as a platform for farmers to exchange knowledge and ideas with diversified stakeholders (Rahman et al., 2019). Therefore, it is important to examine the role of FIAC in providing need based agricultural extension services to the farming communities and their farm business development. The results of this research will be useful for policy recommendations to support agriculture and rural development in developing regions.

1.2. Research Questions

Based on the regional socioeconomic characteristics of the target region and the literature review, we set the following research question.

What factors influence smallholders' access to FIAC services? How FIAC services strengthen local farm households? How will FIAC strengthen farm entrepreneurship in the haor region of Bangladesh?

2. A Selective Literature Review

Innovations are the main drivers to creat opportunities (Christensen et al., 2019). Agricultural extension services play a crucial role in promoting rural innovation and supporting the development of sustainable agriculture. These services bridge the gap between agricultural research, technology, and rural farmers, helping to disseminate knowledge, provide training, and facilitate the adoption of innovative practices (Van den Ban & Samanta, 2006). Nowadays it has struggled to account for socio-political factors especially rendering of power, place, and people inhibits effective agricultural extension (Cook et al., 2021). In addition, effort to improve agriculture may fail in practice due to constraints beyond farmer's control (Baur, 2021). According to Sarkki et al. (2021) social innovations can tackle various challenges in the rural communities including gender equity. Moreover, innovation in rural areas can come from new forms of collaboration; Policies that leverage rural assets and address critical service or product gaps; novel strategies for accessing financial capital; incorporating arts into aspects of community life; and maintaining networks that connect entrepreneurs, organizations and institutions (French, 2022).

2.1. FIAC Model in Rural Bangladesh

Farmers' Information and Advice Centers (FIAC) are set up at the Union Information and Service Center at the union level (the lowest level of local government and rural administrative unit) in Bangladesh. It is a one-stop agricultural extension service center in the Union Parishad (UP) office buildings in the rural areas of Bangladesh and equipped with necessary logistics support for providing extension services towards farming communities and reading materials such as booklets, technology leaflets etc. (PMU, 2021). The FIACs are established with financial support from the National Agricultural Technology Project (NATP), which is jointly funded by the World Bank, the International Fund for Agricultural Development (IFAD), the United States Agency for International Development (USAID) and the Government of Bangladesh (GoB) (PMU, 2021). The FIACs work in cooperation with the mainstream agricultural extension organizations of Bangladesh

such as the Department of Agricultural Extension (DAE), the Department of Livestock Services (DLS) and the Department of Fisheries (DoF) at grassroots level. The representatives of DAE, DLS and DoF are respectively Sub-Assistant Agricultural Officers (SAAOs), Community Extension Agent for Livestock (CEAL) and Local Extension Agent for Fisheries (LEAF). The FIACs provide coordinated services to farming communities related to production, management and marketing of crops, livestock, and fisheries, enhancing a two-way flow of improved knowledge and farming technologies among farm households, extension workers, local NGOs, local governments and other stakeholders. As a result, many people in the rural areas receive one-stop agricultural extension services in the country's rural areas (Rahman et al., 2019) towards livelihood improvement.

2.2. Empirical Studies on Agricultural Extension and Advisory Services

According to Miah et al. (2020) the growth of the agricultural sector in Bangladesh has made a significant contribution to reducing rural poverty but has failed to accelerate the structural change in the development of the time-demand agricultural system. From the comprehensive review, numerous studies have been conducted on different aspects of agricultural extension services. Uddin et al. (2016) conducted a study on crop farmers' willingness to pay for agricultural extension services in Bangladesh. The study revealed that extension and advisory service transfers useful agricultural technologies and provide technical support services to improve the living standards of the farming community. Rivera (2011) conducted a study on public sector agricultural extension system reform and its challenges. The study reported that agricultural extension and advisory services mainly focus on technology dissemination, training and skill development of farmers and raising farm productivity and crop yield. Ragasa and Mazunda (2018) studied the impact of agricultural extension services in the context of a heavily subsidized input system in Malawi. The study found that agricultural extension and advisory services provide technical assistance to farming community to improve their socio-economic condition. Khan et al. (2017) measured the effectiveness of Agricultural Information and Communication Center (AICC) in technology transfer to the farmers in Bangladesh. The study found that more than one third of the respondents (37%) opined that effectiveness of AICC in technology transfer was high while 38% of the farmers perceived the effectiveness as moderate. Farmers' Information and Advice Center (FIAC) is the latest agricultural extension approach taken by the government of Bangladesh to provide demand driven extension and advisory services to rural farmers. Thus, it is crucial to explore the role of FIAC to create rural innovations with the aim of transforming agricultural extension service in Bangladesh.

3. Methodology

3.1. Study Area

This study was conducted in a rural area of Maria Union of Kishoreganj Sadar Upazilla in Kishoreganj District (Figure 1) of Bangladesh. A FIAC center was set up in the study area in 2012.

Figure 1. Map of Bangladesh mentioning the target area of this study.

This area was chosen because Bangladesh's agricultural policy pays special attention to the haor regions (DAE, 2018) and agriculture is the most important livelihood in the region (Rana et al., 2022a). The socio-economic situation of the study area is described in Table 1.

Table 1. Socio-economic situation of study area.

Socio-Economic Parameters	Kishoreganj District	National Average	Source
Population	2,911,907	144,043,700	
Population percentage live in rural areas	83.20%	76.76%	
Population density/km^2	1,083	1,203	
Household size			
Total	4.62	4.35	BBS (2011)
Rural	4.63	4.36	
Urban	4.61	4.29	
Adults' literacy rate (15 years and above)			
Total	41.18%	53%	
Male	43.36%	56.8%	
Female	42.78%	49.2%	
Poverty (Head Count Rate)			BBS (2016)
% of HH below the lower poverty line	34.1%	12.9%	
% of HH below the upper poverty line	53.5%	24.3%	

The residents of the study area have limited access to livelihood opportunities as agriculture is the main source of livelihood. In addition, due to regular flooding from May to October of the year, farming households have less opportunity to cultivate their land (Mohiuddin et al., 2022; Rana et al., 2022a). As a result, the cultivation intensity in the study area (167%) is below the national average (198%) (BBS, 2022). Although national-level poverty has been decreasing over time, it has been increasing in the study area (Figure 2).

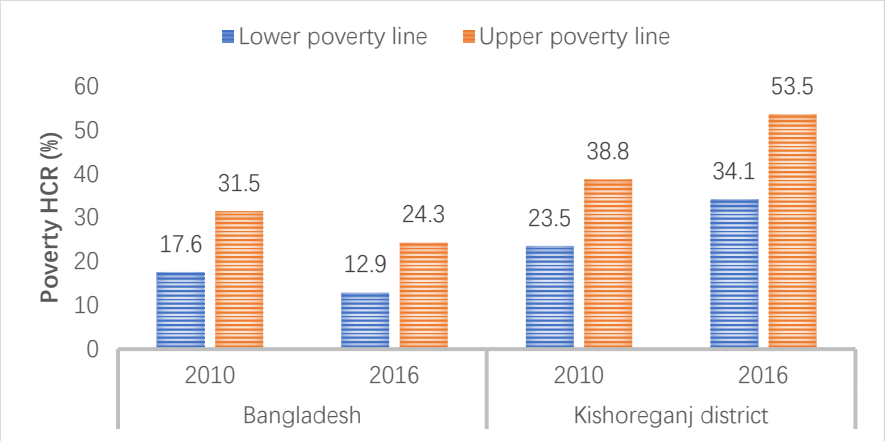

Figure 2. Poverty in study area as compared to national average (Source: BBS 2016).

3.2. Data Collection

Data were collected from the 150 respondents out of 4385 farm families from the study area through face-to-face interview using a pre-tested structured questionnaire from October to December 2022. A focus group discussion (FGD) was conducted with different stakeholders including local agriculture officer, agriculture extension officer, agriculture researchers, farmers, and local leaders, etc. to have a deeper understanding of the issues of this research.

3.3. Variable Settings and Analytical Methods

We set the following variables in our investigation (Table 2) based on literature review and socio-economic situations of farming communities in rural Bangladesh.

Table 2. Variables used in this study.

Variables	Definitions of the Variables in This Study	References
Age	The age of a respondent (years).	Mdoda and Mdiya (2022); Parmar et al. (2018)
Education	Formal year of schooling. But 0.5 score was assigned who can sign only.	Parmar et al. (2018); Mdoda and Mdiya (2022)
Sex	Female (0) and male (1)	
Farm size	Total farm land (Acre).	Parmar et al. (2018)
Farming experience	Duration of engagement in farming activities (years).	Parmar et al (2018)
Annual household income	The annual gross income of the household (thousand Taka).	Khalak et al. (2018); Syiem and Raj (2015)
Social capital	Respondents' social capital was assessed considering their community interaction (bonding social capital) and their connection to different strata of society (linking social capital).	Islam et al. (2011)
Access to the local institutions	It is considered the respondents' contact with different local institutions for receiving technological information and services to improve their livelihood. A four-point rating scale was used.	Mdoda and Mdiya (2022)
Training	The number of days participated in the training programs.	Khalak et al. (2018)
Access to FIAC	It is evaluated by taking into account the level of awareness of the FIAC, the frequency of visits to the FIAC, the services received from the FIAC and the satisfaction with the services provided by the FIAC.	

We introduced mixed method approach to both quantitative and qualitative investigations such as correlation analysis based on the results of structured questionnaire survey of farming families and trajectory equifinality modeling (TEM) analysis (Figure 2) based on case study results to examine the role of FIAC in the transformation of agricultural extension services and farm business development in the rural areas of Bangladesh. We introduced a correlation analysis that can represent the relationship between variables with correlation coefficients to understand the factors that influence access to FIAC services. To perform the correlation analysis, we used SPSS software version 25 (free). In addition, we applied TEM analysis to explain how an individual develops his farm business in society with the support of the FIAC approach.

3.3.1. Trajectory Equifinality Model (TEM)

Trajectory Equifinality Model (TEM) analysis is a qualitative analysis method in social sciences that can represent the variation of individual trajectories with respect to society in irreversible time (Sato et al., 2009; Sato & Valsiner, 2010). The TEM shows the irreversible period with a horizontal axis, but not in a concrete unit, in order to get similar results while following different paths. In this investigation, we analyze based on the analysis model shown in Figure 3.

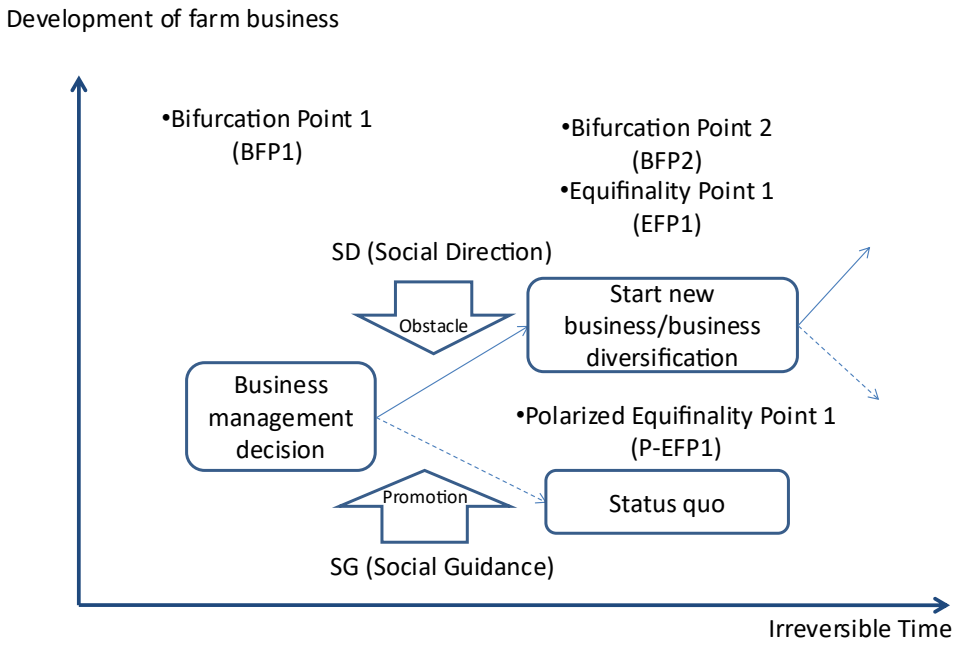

Figure 3. TEM analytical model of farm business development (Source: Based on Kiminami et al. (2020); Rana et al. (2022b).

Here, changes in management decisions that seem to have a significant impact on the development of farm business have been identified as major bifurcation points (BFP). In addition, the socio-economic factors that can influence the management decision, either positively termed as social guidance (SG) or negatively termed social direction (SD), are considered.

4. Results and Discussions

4.1. Major Characteristics of the Respondents

The salient features of the selected respondents' characteristics are presented in Table 3. Without making a detailed classification of the characteristics of the respondents, only mean values and standard deviations were shown to understand the centrality of the characteristics.

Table 3. Salient feature of the selected characteristics of the respondents.

Variables	Measuring Unit	Mean	SD	Min.	Max.
Age	Years	43.00	9.184	25.00	62.00
Education	Years of schooling	6.99	2.756	0.00	10
Sex	Male/female	0.93	0.250	0.00	1
Farm size	Acres	1.25	0.523	0.40	2.50
Farming experience	Years	23.26	9.914	2.00	45.00
Annual household income	Thousands BDT	725.66	293.638	100.00	1500.00
Social capital	Scale score	2.06	0.299	1.00	3.00
Access to the local institutions	Scale score	8.16	1.036	4.00	9.00
Training	Days	2.19	2.263	1.00	28.00
Access to FIACs	Scale score	10.24	0.858	8.00	12.00

4.2. Role of FIAC in Transforming Agricultural Extension Services in Rural Bangladesh

4.2.1. Farmers' Access to the Local Institutions

In Bangladesh, Upazila is the root level of local government and government officials in each section sitting at Upazila level. To serve the large number of farmers, one or two agricultural officials, animal husbandry officials, fisheries officials are not enough. In addition, they have many other public duties to perform besides their own department. It will not work without decentralizing agricultural advisory services to the union level. The establishment of FIAC at the union level has significantly improved farmers' access to local institutions and changed their perception of the services provided by local institutions in relation to farm advisory services. All the respondents mentioned that they visited FIAC in their locality even for a single time. Their frequency of visiting FIAC is shown in Table 4.

Table 4. Frequency of visit to FIAC.

Frequency	No. of Respondents (N)	Percentage (%)
Everyday	3	2.0
Once a week	111	74.0
2–3 times per month	16	10.7
Once a month	20	13.3
Not at all	0	0.0
Total	150	100

Source: Authors field survey 2022.

4.2.2. Technology Adoption Through FIAC and Agricultural Diversification

The farmers participated in the technology demonstrations at the farmer's field level and in training programs organized by the local agricultural offices in cooperation with the FIACs. They received the technological information on the crop, livestock, and fisheries sectors (Table 5) from FIAC.

Table 5. Technology adoption of farmers through FIAC.

Areas of Technological Information Adopted	No. of Respondents (N)	Percentage (%)
Crops	3	2.0
Crops and Livestock	10	6.7
Crops, Livestock, and Fisheries	120	80.0
Crops and Fisheries	11	7.3
Livestock and Fisheries	6	4.0
Total	150	100

Source: Authors field survey 2022.

As a result, farmers are receiving technical advice on how to diversify their farming practices. The traditional agricultural practice of the area is the cultivation of rice, but high value crops such as vegetables are now grown. In this way, the cropping intensity, and the use of resources (land and labor) become more efficient. This is supported by the agricultural production and agricultural diversification at the national level data (Table 6).

Table 6. Crop production and growth of Bangladesh.

Crop	Production (LMT)		Growth (%)
	FY 2008–09	FY 2020–21	
Rice	313.17	386.08	23
Wheat	8.49	12.34	45
Maize	7.3	56.63	775
Potato	52.68	106.13	101
Pulses	1.96	9.39	375
Oil seeds	6.61	11.99	81
Vegetables	29.09	197.19	578

Data source: Agricultural Information Service (AIS, 2022).

4.2.3. Factors Affecting Access to the FAICs

Among the selected farmer characteristics, gender (0.296**), farm size (0.329**), farming experience (0.181*), household income (0.375**) and local institutional access (0.204*) are significantly positively related to access to FIACs' services (Table 7). Female farmers face restrictions in accessing the FIACs due to local socio-cultural barriers. The larger farm size and agricultural experience are the influencing factors to gain access to the FIACs. This is due to their ability to innovate in farming practices. Local institutional access increases farmers' acceptance of technological services provided by FIACs, and FIACs also in turn increase farmers' local institutional access.

Table 7. Results of correlation modeling.

Dependent Variable	Independent Variables (Selected Characteristics)	Correlation Coefficient (r)
Access to the services of FI-ACs	Age	0.148
	Gender	0.296**
	Education	−0.104
	Farm size	0.329**
	Farming experience	0.181*
	Annual household income	0.375**
	Social capital	0.145
	Local institutional access	0.204*

Notes: ** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

4.2.4. Collective Empowerment of Farming Community Through FIAC

The collective empowerment of communities is an important dimension of social innovation (Moulaert & MacCallum, 2019). The FIAC approach equips farmers with updated technical knowledge and technologies as FIAC is an easily accessible rural grass-roots institution. Farmers are satisfied with FIAC's services to a remarkable level (Table 8). They get services from FIACs at free of cost. The majority of respondents said they were willing to pay for FIACs' services even if they had to pay. However, some of them point out that FIACs need to appoint more staff, especially female staff, to deliver services.

Table 8. Satisfaction of farmers to the services of FIAC.

Level of Satisfaction	No. of Respondents (N)	Percentage
Highly satisfied	91	60.7%
Satisfied	58	38.7%
Neutral	1	0.7%
Dissatisfied	0	0.0%
Highly dissatisfied	0	0.0%
Total	150	100%

Source: Authors field survey 2022.

One of the respondents commented on the impact of the services provided by FIAC. He said:

"Having set up FIAC in our village, I can easily contact professional advisors for technical advice on how to improve farming practices. I attended several training programs and technology demonstration meetings organized by FIAC. Now I can advise my neighboring farmers on advanced farming practices if needed. I also feel honored and empowered."

In the following section, we will share the results of a case study using Trajectory Equifinality Modeling (TEM) analysis on how FIAC improves the development of an integrated agricultural business model in the study area.

4.3. Case Study Result of Mr. DM (Development of Integrated Farming Business Model)

The case of Mr. DM was chosen for this study because he developed an agricultural model of an integrated farming system in his area (Figure 4). He has transformed the traditional rice farming system into diversified crop farming along with livestock and fish farming, and through his innovative business model has improved local employment opportunities and food security in the region.

Mr. DM is a farmer from a poor farming family who lives in the Maria Union of Kishoreganj Sadar Upazila (sub-district) under the Kishoreganj district of Bangladesh. He is sixty years old and has no institutional education (SD1). He has been engaged with family farming since his childhood (BFP1). Now, he had 70 decimals of land of his own. However, he found that small-scale rice farming was hard to win in the competition for survival. Incidentally, Bangladesh Agricultural Development Corporation (BADC) has started demonstrations in this area to promote potato cultivation as it is a suitable crop for this area. Farmers receive training and demonstrations on potato

cultivation from BADC (SG1) and he has participated in potato cultivation (BFP2). As a result, farmers are learning how to move out of traditional rice paddy farming (monoculture year-round). In 2012, FIAC was established in the study area with the support of NATP project. The FIAC provides technological services to local farmers in the crop, livestock, and fisheries sub-sectors. Mr. DM was trained by FIAC in vegetables.

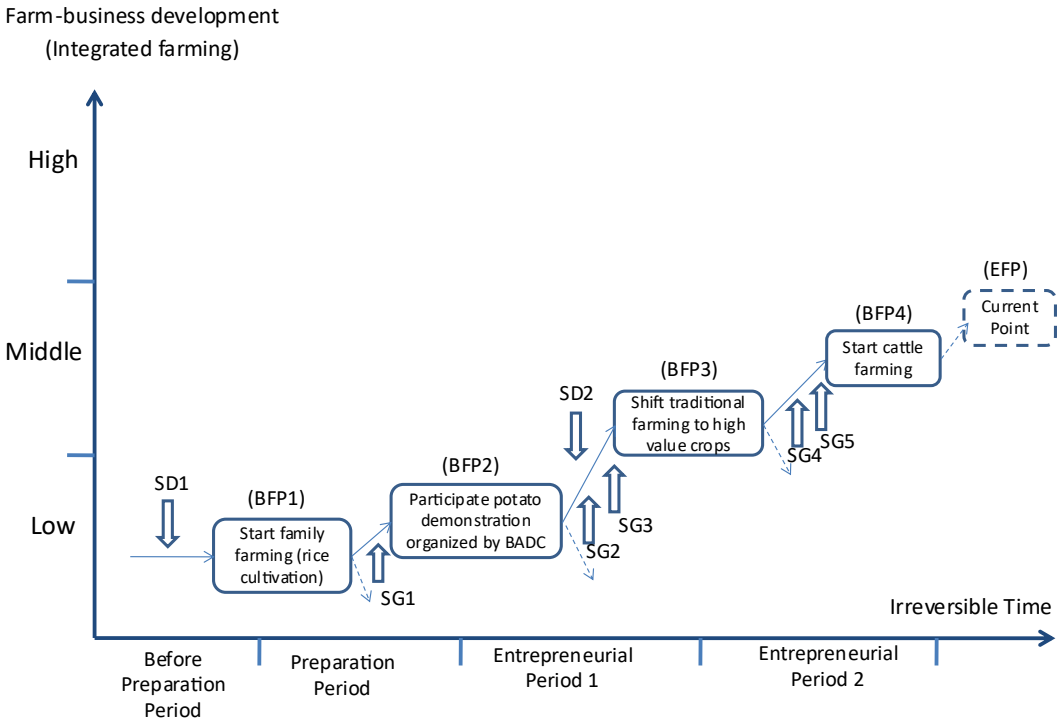

Figure 4. TEM analytical results of Mr. DM.

Growing (SG2) and started growing various vegetables such as brinjal, beans, cucumbers, spinach and squashes, etc. (BFP3). With the help of FIAC, many farmers have switched their traditional rice cultivation to high-quality vegetable cultivation. As a result, farming households generate more income from growing vegetables than from growing rice. The inputs required for growing vegetables such as seeds, fertilizers, pesticides, etc. will be available in the area by then (SG3). He got a substantial amount of animal feed i.e. grass as a by-product from vegetable fields (SG4). Then he started cattle farming (BFP4) to diversify his farming model and increase income with the technical support of FIAC's (SG5) Community Extension Agent for Livestock (CEAL). Now its integrated farming model acts as a role model in the area (EFP).

The summary of the TEM analysis of the case is as follows. First, the FIAC approach gave Mr. DM more access to local institutions, which helped him develop the integrated farming model with the technological assistance from the FIAC center. Second, self-motivation and social capital are also important for the development of his integrated farming model. In order to develop a successful entrepreneurial model, coordinated measures are required (Santos & Neumeyer, 2021). Mr. DM receives training from local institutions and through this has developed his bonding and linking social capital with various stakeholders. According to Putnam (1993), trusts, norms and networks improve the efficiency of society in terms of social capital. He produced a variety of agricultural products for the local market. FIAC also helped him gain access to the local market value chain.

5. Conclusion and Policy Recommendation

Based on the analysis results, we made the following conclusions. First, local farmers have better access to improved knowledge and technology due to interventions of Farmer Information and Advice Center (FIAC). It is a need-satisfying service for the rural farming households to improve their farming practices as well as their livelihoods. Second, their resource use efficiency will be increased, especially land and labor with diversification of agricultural farming. It has improved institutional access locally and farmers feel empowered. So, we can call it social innovation. Third, farmers socio-economic attributes such as gender, farm size, farming experience, household income and local institutional access have a significant positive association with the access to FIAC services. Finally, the supports of FIAC help farmers to develop successful farm business enterprise.

Therefore, our policy implications suggest that FIAC should support the formation and strengthening of farmer groups and cooperatives to enable collective action for better bargaining power, resource sharing and access to markets. Advisory services can be provided to organized groups more efficiently, promoting a multiplier effect. However, farmers experienced some difficulties in obtaining services from FIAC, particularly a lack of competent staff, including female employees. In addition, a gender-sensitive service should be provided to support women farmers to integrate into mainstream agriculture. Therefore, clear coordination mechanisms should be established between relevant government departments, NGOs, research institutions and private sector stakeholders to improve agricultural extension services and ultimately promote rural development by improving farmers' knowledge, productivity and income. FIAC can play an important role in this regard at the grassroots level. However, to generalize the results, similar studies should be conducted for other geographical regions in Bangladesh where the FIAC activities are carried out. This will be our future research agenda.

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