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# Effect of Farmers' Organization-based Extension on Service Delivery and Livelihood: Case of Smallholder Dairy in Bangladesh

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***Authors' contributions***

*This work was accomplished through active participation of all authors. Author MEU wrote the article. Authors MSI and MHR advised, helped in literature search and edited the draft. Author GQ planned and supervised the study. All authors read and approved the final manuscript.*

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## ABSTRACT

The main focus of this article was to examine whether or not there are comparative advantages of farmers' organization-based (FBO) extension service over services provided by other agencies. "Advantage" here means demand driven, effective and sustainable extension services. The approach here was to review published work and unpublished documents with a thematic approach. The content and context of free public extension and paid FBO-based extension in smallholder dairy systems of Bangladesh were examined. The impact of the services on farmers' quality of life was also examined. Considering the global evidence, this article recommends that vigorous and market-oriented dairy cooperatives, with honest and efficient leadership, can create an advantageous alternative to the weak State-provided extension services. Such cooperatives can

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promote agricultural growth and rural development as well. The sustainability of those FBOs which are self-organized and address strongly-felt needs was high. The sustainability of those cooperatives which were hurriedly-organized by external actors was less so. The authors recommend a special dairy development plan of the Government organized around cooperative extension, can offer training to the staff and interest free credit to the farmers, for establishing processing plants to promote sustainable dairy farming and improved livelihoods.

*Keywords: Bangladesh; dairy farmers' livelihoods; farmer-based organization; paid extension.*

## 1. INTRODUCTION

The population of Bangladesh has been increasing continuously since her birth in 1971, giving a figure of about 160 million, while cultivable land has been declining at a rate of 1% per annum. This dual pressure poses a continuous challenge to achieve food and nutritional security goals. The pressure of high demand for food has forced the replacement of traditional means of agriculture with partially-mechanized strategies: bulls have been replaced by tractors [1]. Consequently, an opportunity now exists to produce dairy cows instead of bulls. To satisfy the food and nutritional demands of a growing population, homestead dairy farming may play an important role. Milk can provide a nutrition-rich diet, as well as cash. The current per capita milk consumption is 52 g/day/person [2]. To satisfy the milk requirement of 250 g/day/person, the national production should be almost doubled [3,4]. In addition, a large section of the rural sector belongs to small, marginal and landless farms, which present the opportunity to utilize their family labor force for productivity.

Smallholder dairy farmers of Bangladesh produce 70 to 80% of the national dairy milk [2]. About 40% of the total milk is consumed as liquid raw milk. A 5-10% of the total production has been processing [5]. Of the total processed milk, 90% is liquid packet milk and only 10% is processed products of different kinds. The total milk of the country comes from four different kinds of dairy production systems: the traditional system, the extensive system, the intensive system and the bathan system [2]. The smallholder dairy mostly belongs to the traditional system and partly to the extensive system. The dairy cattle of smallholders are grazed outside and rest of the time depends on stall feeding. The intensive dairy production is a specialized and commercial system with zero grazing practice. The big free grazing dairy hard (4-30) is called bathan which is found in Sirajgonj and Pabna Districts of Bangladesh. However, throughout the country, the numbers of market-oriented smallholder dairy farms are increasing day-by-day. Accordingly, the need for dairy extension services is increasing. Although essential, ensuring demand driven and quality dairy extension services in places have been challenging gradually.

### 1.1 Government Policy Failure

Unfortunately, the Government of Bangladesh has no robust policy for smallholder dairy development. Dairy extension policy and services have been merged with overall national livestock extension policy and services [6], which indicate a lower priority for dairy extension. The Government's main remaining pro-dairy policy is a 20% reduction of electricity charges for all kinds of commercial farms, and exemption of pasteurized milk from value added tax [7]. However, the household smallholder dairy is not treated as a commercial farm: so it does not get the lower electricity rate. Smallholders cannot afford pasteurization so their milk is taxed on its value-added. Worse still, the policy of 35% tariff reduction on powder milk import has made dairy farming less profitable [8], as many people will buy the powdered milk instead of smallholder unprocessed milk, even at a higher price. National livestock extension policy focus on many important issues such as (i) private sector participation (ii) bottom-up planning by community-based farmers group (iii) veterinary, public health and food safety concern (iv) farmers' organization-based demonstration and adoption (v) one-stop livestock extension service for backward linkage (vi) mobilizing farmers group (vii) linking research-extension-education-farmer and so on. Lamentably, there is little to be seen of most of these policies in practice. Government policy and public extension services have failed to develop profitable market channels for the farmers: an essential for sustainable rural development in agrarian Bangladesh [9].

## 1.2 State Agricultural Extension Services for Livestock Farmers

Department of Livestock Services (DLS) is responsible for offering public extension services to livestock farmers. DLS executes its services through a network of 9 regional diagnostic laboratories, 17 district diagnostic laboratories, 1 vaccines' production laboratory and more than 470 Upazila [1] veterinary hospitals (UVH). The UVH is one-stop local center to obtain veterinary services at grassroots level. Only one veterinarian is assigned to serve a large number of poultry, dairy and other livestock farmers (Fig. 1). Regrettably, delivery of extension services to farmers' homes is not accessible to most rural smallholder dairy farmers. In many cases, farmers had count their coins to access "free" extension service, at a price even higher than that of private extension services [8]. Absenteeism in the work place and unwillingness to respond to farmers' calls are the major problems in the State extension service. Weak monitoring, poor funding, insufficient staff and lack of facilities for emergency response are other limitations of the State extension service. Smallholder dairy farmers are geographically scattered in remote villages. Many farmers are still unaware about State extension services. Many other farmers have lost in State extension services. Consequently, some farmers have to private consultants, paravets, and outright "quacks" for veterinary services. Moreover, market linkage and market information delivery are becoming essential to the dairy farmers: yet these are almost absent in the present State extension systems [8]. The government has some breeding farms, which produce semen and distribute it among the farmers through Artificial Insemination (AI) centers. The number of AI centers is insufficient and they offer poor services to the farmers. Government AI and vaccination service respectively can cover only 6.5% and 10% of the demand, respectively [10]. Many important extension works run on project basis: thus, the service is terminated at the end of the project [11]. For example, a recent project conducted in three Upazillas of northern Bangladesh proved that dairy extension among the common interest groups (CIGs) plays a significant role in poverty reduction [12]. However, the service is no longer continuing due to termination of the project. Therefore, client responsive and sustainable extension services deserve attention of alternative extension providers.

## 1.3 The NGO Alternative

According to Rashid & Gao [13], more than 20,000 NGOs are working in Bangladesh, of which 400 have agricultural programs [14]. NGOs deal with marginal and landless farmers, the majority of which are women. NGOs provide dairy extension services only to their beneficiary groups (Fig 1). Except micro-credit, most of their activity is on a project basis, which is highly dependent on foreign donors. These services are unsustainable in the absence of donor funding [13]. Grameen Bank, for example, through its Community Livestock and Dairy Development Project (CLDDP) with the assistance of UNDP and FAO provided livestock and dairy extension supports to its beneficiaries. CARE had a project (2007-2011) for improving the livelihoods of landless and smallholder dairy farmers, through inclusion in a strengthened dairy value chain. TMSS, one of the biggest national NGOs, has a participatory livestock development project (PLDP), which offers a range of services to the livestock farmers that will end very soon [8]. So, the transient nature of NGO extension delivery again pushes the smallholder dairy farmers towards vulnerable situation, as dairy cattle needs intensive veterinary and husbandry services. In this situation, many scholars are advocating private sector participation to increase pluralism in extension service delivery [15].

## 1.4 Extension Services by Dairy Companies

Most of the private dairy companies, such as BRAC, Aftab, Pran, Ammo Milk, Akij, Shelaida, Bikrampur, Tulip, Safa, Rangpur Dairy etc work with farmers on a contract basis. They offer loan for buying dairy cows. Some new milk companies, such as Rangpur Dairy, have heifer supply and heifer-back program. These help smallholders build or expand a herd of dairy cattle. The advantage is that the company does not need to manage a big dairy farm where investments and management cost are significant. BRAC dairy collects milk from 100 collection points throughout the country of which 10 are in ultra-poor areas. BRAC offers a fair price for quality milk through inclusion of DFT (Digital Fat Testing) technology. However, in

[1] *Several Villages make up a Union Parishad which is a local government and several Union Parishads make up an Upazila which is a higher tier of local government in Bangladesh.*

some cases, there is a claim of misappropriation in fat determination by the DFT technician, as a source of additional income for them [8]. Other than this, BRAC also offers dairy cattle management training and vaccination and fodder cultivation support to their beneficiary farmers. Other companies provide technical support and expertise to the farmers (Fig. 1) to bring about qualitative and quantitative change in milk production. However, as the companies are profit-oriented, they care for production maximization: little attention is paid to increasing the price of collected raw milk paid to the farmers. The benefit to the farmer is guaranteed purchasing by nearby company outlets, which saves them time, effort and risk in finding customers [8]. Rashid & Gao [13], in this regard, said that the service efficiency of private companies is less than that of the State services, NGO services and cooperative extension services. However, although less efficient, this kind of extension service is self-sustaining because it creates its own revenue.

### 1.5 Market-oriented Dairy Farmers' Cooperatives

Market oriented farmers' cooperatives can share the cost of extension delivery where public extension is absent or inefficient [8]. Bangladesh Milk Producers' Cooperative Union, which has the largest share of the country's milk market, popularly known as Milk Vita, has about 1,500 producer groups at the village level. This primary producers' cooperative offers veterinary services, artificial insemination, credit, fair price feed supply, farmers' training, guaranteed milk purchasing and a fair price to farmers for their milk (Fig. 1). The Union collects the service delivery charge from the per unit milk sales of each cooperative farmers. Milk Vita collects milk from farmers through its agents. Its product is processed by 12 chilling plants and 1 pasteurization plant [16]. Although it is profitable, Milk Vita covers only a limited geographical area and a small fraction of the nation's total milk production. Usually large- and medium-sized farmers are involved with Milk Vita. The smallholder dairy farmers can build on Milk Vita's model to create their own dairy cooperative in the many places and for the many farmers not served by Milk Vita. There are numerous farmer-based organizations in Bangladesh but, unfortunately, limited numbers of those organizations are working for value chain development and channelizing farm information [13]. Although, some local and regional evidences show good prospect in FBO-based dairy extension over public extension, the nationwide applicability and sustainability of this model is yet to be explored. On the other hand, inefficiencies in FBO-based extension approach

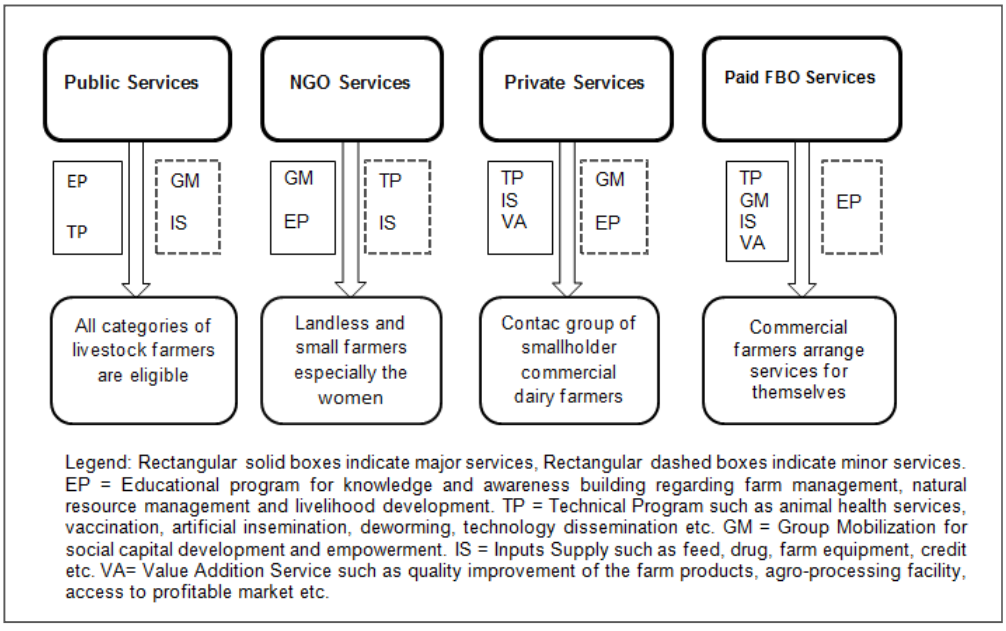


**Fig. 1. Different types of dairy extension services in Bangladesh and their major clients**
*Source: Adapted by authors following Rashid and Gao [13].*

are also criticized in some cases. Therefore, the researchers have raised the following questions in searching a successful FBO-based dairy extension. When and why do farmers need to organize themselves for accessing paid extension services? When do the organizing efforts achieve a poor FBO result? What management standard does a functional FBO desire to be successful? How can the government policies play roles in delivering sustainable extension services for improved livelihoods of the smallholder dairy farmers of Bangladesh?

## 2. METHODOLOGY OF THIS STUDY

The study analyzed published content about farmer-based and privately-managed extension services to smallholder dairy farmers. The sample considered for this study consisted of peer-reviewed journals, books, development reports, magazines, newspaper and online resources published from 1992 to 2016. The online information was collected through different search engines (Google, Yahoo, Bing, Smart Search etc.) and specific web surfing. The hard resources were obtained in libraries. Searches provided about 320 documents of which 270 were sorted by skimming the topic relevancy. A thematic approach was followed to index the documents and to use the information for this report. The most attention in storing was paid to the nature of publication, year of publication and regional coverage of the information, regarding the research topic. Similar approaches can also be found in the published work of Baru & Woller [17] and Rahman et al. [18]. However, the findings of 85 studies have been ultimately used in writing this article. The rest of the documents have made a passive contribution in developing insight and confidence of the authors regarding the subject matter of the study.

## 3. PROBLEMS OF SMALLHOLDER DAIRY FARMERS IN BANGLADESH

Although the environment for dairy smallholders is favorable, due to easily accessible labor, a huge demand for milk and a bigger demand for beef, there are a number of obstacles to developing this potential. The smallholder dairy farmers face obstacles from the opening of the farm to marketing of the produce. The most common obstacle identified, as shown in Table 1, is poor State extension services. Other problems identified, in order, were a low productivity rate, poor milk marketing channels, poor knowledge of the farmers about disease and feed management, high input prices, lack of good breeds and death of cows due to wrong treatment by veterinary quacks. Poor State extension services refer to the facts, as stated about that DLS's services can cover limited areas, offer inadequate and infrequent visits, and lack responsiveness, accountability, greed and professionalism of the extension officers and staff. Strengthening State extension systems is a way to overcome the barrier. However, it is very difficult to strengthen the State services due to fund shortage, widespread corruption and political protection for wrongdoers [9,19]. Considering the facts, many scholars have suggested community-based or cooperative-based extension to empower the smallholder dairy farmers in achieving the demand-driven services they need.

Low productivity is the second most mentioned obstacle to smallholder dairy development in Bangladesh (Table 1). Low productivity occurred due to disease, malnutrition, and physical stress on cows. In many cases, farmers fail to detect estrus symptoms. Sometimes cows go into heat a second time, which reduces their milk productivity time. If heat is not detected in proper time it badly affects the fertilization. In Bangladesh, cows usually go into heat between the ages of 2.5 to 3 years. With proper nutritional and health management it can be 1.5-2 years. The findings suggest several solutions such as farmers' training, on-time heat detection, appropriate feeding practices, improving AI service, not using cows for draught purpose, regular veterinary and advisory services etc. As State extension services seem poor, regular veterinary and advisory service can be ensured through multiple extension providers. However, Uddin [8] and Shamsuddin et al. [20] found that community-based dairy veterinary foundations (CDVF) offer a holistic reproductive service to its beneficiary farmers. Therefore, they have suggested to promote community-based dairy extension throughout the country.

Poor demand and price for raw milk prevails in remote rural areas of Bangladesh. Due to poor linkage or no linkage with urban market and processing industries, a huge amount of raw milk is either spoiled or sold at the rate of water. Public extension has failed to link farmers with secondary and tertiary milk producers. In fact, public extension in Bangladesh does not provide market information delivery [8]. Therefore, a pro-

farmer market policy intervention has been suggested to construct a profitable milk market for the milk farmers. Some scholars stress that developing a milk aggregation model to attract processors or establishing small milk processing plants by farmers' cooperatives would be a better solution to the problem (Table 1). Dairy cooperatives can employ community extension workers to offer veterinary services and maintain market liaison.

**Table 1. Problems and solutions of smallholder dairy development in Bangladesh**

| Constraints in smallholder dairy | Ways of solving problems | Source |
|---|---|---|
| Poor public extension services for the dairy farmers: inadequate, ineffective, infrequent | Promoting community-based dairy extension. | [8] |
| | Strengthening public veterinary clinics, developing private clinics. | [21] |
| | Cooperative based extension service. | [22] |
| | Strengthening organizations and support service. | [2] |
| | NGOs and private services. | [10] |
| | Effective veterinary, AI and market services through farmers' cooperative-based extension. | [23] |
| | Promoting private extension service. | [24] |
| | Pluralistic extension service to remote place. | [25] |
| | Making extension demand driven through private participation. | [26] |
| | Linking producer groups to vets, animal health outreach workers, and artificial insemination service providers. | [27] |
| Sub-productivity/ low conception rate | Improvement in feeding, proper heat detection, taking reproductive health care and AI services. | [28] |
| | Farmers' training on management of cattle reproduction. | [29] |
| | Appropriate feeding, timely heat detection. | [30] |
| | Appropriate feeding, radioimmunoassay of milk progesterone for fertility control, not using cow for draught purpose, improving number of spermatozoa per dose of AI and promoting community-based productivity service. | [20] |
| | Proper handling of frozen semen. | [31] |
| | Appropriate feeding standard. | [32] |
| | Community-based productivity service. | [33] |
| Poor and untrusted milk market/ value chain | Development of a market linkage. | [29] |
| | Construction of proximal milk market and linking with industry. | [34] |
| | Institutional service and policy intervention, establishment small processing plants by farmers' group. | [22] |
| | Development of milk market through famers' cooperatives. | [23] |
| | Producer oriented price policy. | [32] |
| | Farmers' organization-based milk aggregation models to enable smallholders to attract commercial buyers and increase their bargaining power. | [27] |
| Poor knowledge of the farmers in disease and nutrition management | Farmers training and farm visit by community extension. | [8] |
| | Farmers' training and doorstep service. | [21] |
| | Strengthening public extension policy. | [22] |
| | Strengthening institutional support. | [2] |
| | Farmers training on feed management and fodder preservation techniques. | [4] |
| High price and poor quality inputs especially feeds and medicines | Supply of inputs by community extension in "no profit no loss basis". | [8] |
| | Policy intervention. | [22] |
| | Alternate feed supply. | [35] |
| | Farmers training on feed management and fodder preservation techniques. | [4] |
| | .Farmers training on appropriate feeding standard. | [32] |
| Lack of access to good breed | Cross breeding. | [34] |
| | Breed development through AI. | [4] |
| | Extensive AI program for breed development. | [32] |
| Death of cows by veterinary quack | Provision of training for the veterinary quack. | [8] |

Poor farm management knowledge of the farmers has long been playing a negative role in dairy development. In rural Bangladesh, many of the smallholder dairy farmers are poor and illiterate. Therefore, they cannot follow written scientific farm management guidelines. Moreover, due to ignorance, they are unaware about infectious diseases and balancing the diet of dairy cattle. For example, *mastitis* is a deadly infectious udder disease but many farmers still think that it happens due to sucking of milk by the snake [8]. Farmers' training has been suggested as the short-term solution of this problem but an efficient extension service would include such information.

High price and poor quality of farm inputs are common claims of the dairy farmers [8]. Input prices in remote rural markets are very high while the price to farmers for raw milk is very low. Transport costs probably pay a major role in this: few inputs are produced in rural areas. Therefore, high production cost is discouraging farmers to continue commercial dairy production. Government policy intervention has been suggested to control market prices of inputs and outputs. However, simple price controls could cause the inputs to disappear in the remote areas if the controlled price is less than the cost of production plus transport. Also, in a country like Bangladesh, price control does not necessarily mean lower prices but wealth opportunities for enforcers. Still, the money to pay them might have to come from even higher prices for farmers. Similarly, fixed high prices for farmers could lead to overproduction of milk and make powdered milk look cheap as well as healthier. Such a policy could turn the drains white and the farmers into beggars.

A more workable suggestion is that farmers can be trained on fodder cultivation and preservation, which minimizes the feed cost. Uddin [8] found that some community extension centers sell inputs at fair prices. The community extension workers have good connections with input suppliers. The service saves time and money of the farmers. However, the common service charge is collected from per unit milk sales by the farmers (@1 TK per Liter). In the end, someone has to pay for the "fair price" and it turns out to be the farmers paying themselves.

Milk production is a function of cattle breed. Bangladesh has a shortage of good breeds. The good breed cows are very expensive. Therefore, poor farmers lack buying capacity. The only way is breed development through cross-fertilization. In this regard, an extensive AI program has been suggested. Death of cows due to wrong treatment by veterinary quacks also reveals a problem. However, the consequence is very severe as it brings total loss to the farmers. Sometimes it pushes poor farmers near hunger. Uddin [8] in his study on community-based dairy extension found that many veterinary quacks are gaining informal training from community veterinarians that significantly decrease their casualty rate. The study disclosed many other problems, related to infrastructure facility and credit access, which significantly affect the development of the smallholders' dairy industry. They are outside the focus of this study on extension services. Yet we can note that a fully-efficient extension service would also link farmers to sources of credit. Infrastructure is a matter of State policy and investment.

## 4. THE IMPORTANCE OF PAYING FOR WHAT YOU GET

Agricultural development significantly depends on delivery of quality advisory services to the farmers [36-41]. However, public extension services in developing countries, like Bangladesh, are often criticized for offering backdated services [19,14,42,43,44] together with poor operational skill [45].

The State extension service of Bangladesh is top-down and more demand-ignoring than demand-driven [46]. Although, the operational expenditure and number of households is increasing, the budget for state extension services is not increasing proportionately. There is little budgeted in the State extension service for service delivery, such as travel, program planning and in-service training. How could there be?: more than 80 percent of the extension budget is spent for salaries [47]. A very little percentage is used for demonstration, farmers training, etc [11]. Therefore, a huge number of farmers remain out of service, especially in remote areas. In this circumstance, many farmers of Bangladesh are gradually diverting towards private service. However, private sector extension providers are interested to work with large, medium and commercial farmers who are able to pay a large enough amount to make their work profitable [48,49].

Globally, the public extension systems are facing changes and challenges, State budget cuts and changing demands of the farmers [50]. The

emerging economic, political, social and environmental dynamics have influenced the strategy of provisioning extension services. Climate change, trade liberalization, globalization, information revolution, population growth, etc. has further shaped the farmers need that call for more demand-driven, cost effective and efficient service delivery [51-53]. Dwindling public funding for extension, particularly after the end of World Bank funding for agricultural extension in 1990s, has led to reduction of staff and inadequate operational budget in South Asian countries [54]. In the history of agricultural extension this period is considered a critical stage of State extension services. Agricultural extension again began to be perceived as a valuable service during the world food crisis of 2008. Since the late 1980s, diverse agricultural extension funding and delivery arrangements have been undertaken by many Governments worldwide in the name of "privatization" [55]. Actually, the term *privatization* became popular after presenting the Latin American development policy prescription to Washington in 1989 ("Washington Consensus"). Fiscal discipline, reforming public expenditure, interest liberalization, competitive exchange rate, tax reform, privatization, trade liberalization, investment liberalization, deregulation and property right were the 10 policy suggestions for development [56,57].

State extension services in developed countries have been privatized for long time and developing countries are in the process of gradual privatization. Amungwa [58] said that privatization is happening as a result of budget shortage for the Governments to manage extension costs and need for extension agents to be accountable to clients. Experiences in various parts of the globe [59,60,42] mirrored inefficiencies in resource allocation that are unavoidable if a service such as extension is free of charge to stakeholders who might be able to and/or willing to contribute to obtain appropriate service. In general, if there is corruption, that is because there are clients who have money to pay. Extorting poor people may give a sense of power to the corrupt civil servant, who gets transient pleasure out of kicking them rudely out the door, but he will never get rich that way. The pervasiveness of corruption in State services in poor countries suggests that the people may not be as poor as they appear: or at least that they can get large sums of money (in their perspective) if they think they can get something that they want that way. Services that are fully or partially paid by the clients are more likely to be demand-driven than that of services provided at free of cost [61]. In addition, when farmers pay for the service the attendance and implementation rates are more than 70 percent [62].

Budget cuts and a weak State extension system have created an institutional vacuum that has excluded smallholder dairy farmers of Bangladesh from information access [14]. Therefore, the poor smallholder farmers are being marginalized. Some commercial smallholder dairy farmers are receiving paid service from veterinary quacks and paraprofessionals where there is chance of real loss to the farmer and the livestock. Moral hazard and adverse selection, due to ignorance of farmers and information asymmetry between agents and farmers, are also real problems [63]. At present, a State veterinary surgeon of Upazila level is responsible for serving about 150,000 animals, which is certainly beyond his capacity. Moreover, he can cover at best 10 kilometers around the center. Therefore, a large number of farmers remain out of the real service area. The State extension service is therefore, neither free, sufficient nor better in quality. Thus, service delivery at grass-root level is inadequate, ineffective and infrequent [25]. In this circumstance, the better way is to organize commercial farmers of different kinds into cooperatives and let them employ extensions workers in the community to offer demand-led services to the farmers under their control and supervision [64].

## 5. FARMERS' ORGANIZATION-BASED EXTENSION SERVICES AND FARMERS' LIVELIHOOD

A Farmer-Based Organization (FBO) is a formal or informal membership-based collective organization having an institutional framework that serves its members, who are usually rural dwellers, and partially or entirely dependent on agriculture (crops, livestock, fisheries or other farm activities) for livelihood. FBOs provide a platform, to share information and ideas, pooling resources together, to gain market access, to raise their voices and to be partners of development organizations rather than remaining beneficiaries. According to Chamala & Shingi [65], farmers' organizations can be categorized into (i) community-based resource-oriented farmers' organization and (ii) commodity-based market-oriented farmers' organizations. The first

one may be a rural cooperative or farmers association that deals with essential production inputs of land, water and animal-based enterprise to enhance productivity. These organizations are quite small, confined to a particular area and highly concerned about inputs. The second one emphasizes on production of specialized product or value added products. Thus, it is known as output-dominated organization. The regional growers organize and invest share capital to arrange processing technology, credit facilities or professional manpower for advisory services. Anand dairy cooperative of India and Bangladesh Milk Producer Cooperative (Milk Vita) are examples of such organizations.

Bangladesh possesses about 198,114 FBOs with various names such as Farmers' Organization (FO), Farmers' Cooperative (FC), Farmers Development Cooperative, Farmers Association, Adarsha Samobay Somity (Ideal Cooperative Association), Farmers Cooperative Association, User Groups, Producer Groups, Common Interest Group (CIG), Community-based Organization (CBO), Producers Organization (PO), Producer Cooperative Union, Farmers Federation (FF), Commodity-based Cooperative Association, Commodity-based Foundation etc. Most of the FBOs of Bangladesh are small, comprising 20-25 members, and run at community level. The majority of them have been formed with the support of government extension agencies, funding agencies or NGOs. There are only 12 autonomously-formed FBOs in Bangladesh. The Department of Livestock Services, the public livestock extension organization of Bangladesh, possesses 5,603 FBOs. The Department of Cooperatives recognizes 1,577 milk producers' cooperatives in Bangladesh. These FBOs have made significant contribution to improving the livelihood of the poor farmers in many ways [66].

The roles of producers' organizations (POs) in improving livelihood, food security and mainstreaming rural producers to development are now widely recognized [67]. Therefore, it is necessary to organize rural men, women and young people into various groups for enhancing rural livelihood [68,69]. Farmers in FOs play a dual role: as individuals they receive service and as a cooperative they provide support to others. Abokyi [70] found that FBOs increase productivity of crops and livestock through provisioning training, advisory services, credits, and technological inputs to the farmers. FBOs provides market information and marketing access to the high value producers through value-adding actions like agro-processing and creating a linkage between buyer and producers [71,72]. One of the criticisms in the application of FBO-based approach to livelihood development is the lack of stress on market [73]. Actually, a successful FBO should pursue business orientation rather than receiving external assistance. Swanson [74] suggested that market-oriented farmer-based extension is effective and sustainable because of market specification, economic scaling-up and short supply chains that exclude local traders or middlemen.

It has been discovered in CDVF (Community-based Dairy Veterinary Foundation) model of Bangladesh that about 200-250 smallholder market-oriented dairy farmers can organize themselves to make an association along with different sub-groups in the community (Fig. 2). This association can easily employ a veterinary doctor for productivity-raising veterinary services. The association makes different links with input and output suppliers for easy and fair access to markets. This approach has shown a positive effect on the farmers' livelihood through offering increased income, better knowledge and skill, more employment, better food security, more savings, improved physical assets, stronger social network and peace and security at the family and community level. On the other hand, farm vulnerabilities such as death of cattle, health shock of dairy animals, seasonality in milk price, of production, and feed and nutritional securities have been reduced significantly. This type of FO is playing a key role in shaping livelihood opportunities and livelihood outcomes [75]. However, milk marketing is still a concern to the poor farmers due to the lack of processing facilities and loss of buyers [8].

Cooperatives based dairy activity in India started with the birth of Anand Milk Producer Union Limited (AMUL) in 1946. Among the big cooperatives, Anand, Gujarat, Rajasthan and Uttarakhand Cooperative Dairy Federations are mentionable. Besides these, a lot of small cooperatives are working throughout the 14 major milk-producing states of India. Chander & Sulaiman [76], in a very recent study, mentioned that limited extension delivery funds and poor access to public extension services has pushed dairy farmers towards cooperative-based extension service which created a demand for strengthening national dairy extension service and reviving the defunct dairy cooperatives.

Gujarat Cooperative Milk Marketing Federation, which has been functioning for more than 35 years, has 2.8 million members, delivering about 8.4 million liters milk per day. It has also provided artificial insemination service to more than 3.5 million dairy cows [77]. In an Indian study, about 70 percent of farmers agreed that cooperative extension played important role in improving dairy management and marketing channels [78]. The National Dairy Development Board (NDDB), through its National Dairy Plan (NDP), is offering management training to the milk union members. They also arrange visits to dairy and fodder plants for the cooperative farmers. Cooperatives, on the other hand, provide paid services for breeding, veterinary services, husbandry services and marketing services to the dairy farmer, which has brought a significant improvement in the livelihood of smallholder dairy farmers. However, the most motivating factor in inducing the farmers to join dairy cooperatives was help for farmers with marketing and breeding. On the other hand, corruption by powerful people under political protection and poor leadership role of cooperatives has been reported as major driving forces in defunct cooperatives [76,78,79]. Hence, quick payment for milk, a remunerative price of milk and honest leadership are sought.

Sub-Saharan African countries are also trying to organize FOs and their number is increasing day-by-day. Among them, the effort of Burundi, Cameron, Ghana, Kenya, Madagascar, Malawi, Mali, Namibia, Senegal and Uganda are mentionable. Moreover, the project-based extension services of some Asian countries like India, China and Indonesia have shown good performances in organizing FOs and continue. Currently, China has 110,000 registered FOs and 40,000 informal producer groups [80]. Globally, most of the FBOs are operating at the community level, some are up to district level and very few are at national level. A research study of 16 African countries shows that FBOs federated at national level play significant roles in addressing farmers' problems [75]. However, the findings on African FOs show that there is a growing discrepancy in delivering extension services between the smallholders' and community-based farmers' groups, who are oriented towards improved livelihoods, than the larger commodity-based FOs [81]. Indeed, FOs are ineffective where large commercial farmers have taken the leadership from the small farmers. The legacy of dishonesty and incompetence of cooperatives in history may have eroded optimism of farmers to organize and work in groups [82]. Therefore, it is important for extension to motivate and help these weak groups to diversify and/or intensify their production system for better livelihood outcomes [83]. The most important is that FOs need to learn new leadership, organizational and financial skills to be successful. When commodity-based farmers organize themselves in self-help groups (SHGs) and gain access to different markets their organization becomes sustainable.

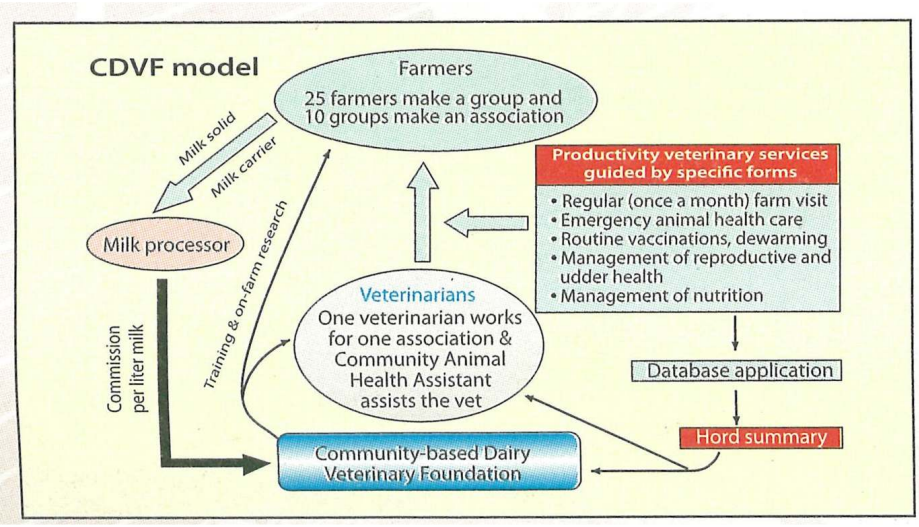


**Fig. 2. CDVF model of FBO-based dairy extension in Bangladesh**
*Source: CDVF in Uddin [8]*

Although many FBOs have been formed with external help around the developing world, many of them are financially-vulnerable and administratively weak. When FOs do not have adequate information access, operational funds, cultural exercise, capacity-building support, strong policy and legislation they became weak and cannot influence powerful actors to meet the needs of the members. True autonomy, strong leadership, and strong membership are equally important in achieving sustainable FBOs; otherwise, the benefits of the FBOs are captured by the elite class. Large-scale, commercial farmers have more financial power, technical skill and leadership than that of small and marginal farmers [67]. Miranda [84] stated that an ad-hoc, hurried FBO construction, under force, to achieve intervention targets leads to poor FBO results. Chamala & Shingi [65] stressed that the traditional way of organizing farmers needs to be altered in order to address the challenges of sustainable livelihoods at community level. Extension in this context has an empowerment role, community organizing role, human resource development role, problem-solving role and education role. However, developing powerful, effectively-managed farmer organizations takes long time and emerges as bottom up.

## 6. DISCUSSION

Ideally, in the FBO extension approaches, the market-oriented smallholder farmers enthusiastically organize themselves into producer groups and employ private extension workers. Severe fund shortage, limited access, and absence of demand-driven services in public extension service instigate farmers to decide on FBO extension services. Actually, dairy farmers prefer FBOs for providing better access to secondary and tertiary markets, quality extension service, as well as milk processing facilities, which in turn ensures better product price. However, as do many other new extension approaches, FBOs are also not free from limitations. Reviews and practical experiences showed that the major limitations of FBO extension lie in their formation and execution. For instance, many FBOs in different parts of Africa and India were malfunctioned due to lack of efficient and fair leadership, although formed on the felt-needs of the clients. FBOs manifestations in Bangladesh are also erroneous, in many cases. Failure in realizing the felt-need during group formation is a conspicuous problem. Disregarding farmer's interest, almost all the FBOs in Bangladesh were formed with the interest of funding agencies, and thus controlled by intervention agencies. As a result, these FBOs were usually collapsed at the end of the project. FBOs federated at national level showed better impact [16,75]. However, Bangladesh milk produces cooperative union (Milk Vita) is occasionally criticized for political affiliation and corruption of the leaders. The governing bodies of these FBOs were composed of both farmer representatives and government representatives. Therefore, there is always a chance of government and political influences, although this affiliation in some cases, benefits farmers with input subsidies, infrastructure facilities, and pro-producer policies.

Despite noticeable viability, FBO extension approach in Bangladesh also has some other impediments. In the process of commercialization of their products, farmers face different obstacles. In reality, arranging extension service is not so problematic, rather installing milk processing facilities is highly challenging. The poor farmers' group cannot pool enough seed money for installing a milk processing plants. So, arranging processing facilities or creating immediate marketing facilities is very crucial. In this circumstance, a limited number of dairy FBOs, such as CDVF, are running with the cooperation of private milk processors. As per inherent design of the model, a share of the profit goes to milk processors. With this limited surplus and under-developed infrastructure facilities, it is really very difficult for the dairy association to employ a qualified and experienced veterinarian, although, professionalism is higher among the paid veterinarians of the FBOs, than that of public veterinary surgeons [8]. The possible reason might be, the job security of the community veterinarians depend largely on the sincerity and accountability, what is nearly absent in public extension service. Public extension service, though, proportionately better in terms of quality, is interrupted [13] and bothering for the farmers [8]. Moreover, the clinical facilities of the public veterinary hospital are inaccessible to many remote rural dwellers.

In this situation, the commercial farmers eventually prefer to pay for easy access and availability of service at their doorsteps. In the CDVF dairy extension model, the service charge for the regular farm visit is partially compensated by the milk processors. So, the farmers need to pay only the emergency service charge (100 TK) which is significantly less than the cost (≥300 TK) required for delivering public extension service at

**Table 2. Comparison between traditional free extension and paid FBO-based extension approach**

| Criteria of comparison | Traditional free extension | Paid FBO-based extension |
|---|---|---|
| Service delivery nature | Mostly supply driven and holistic | Mostly demand driven |
| Responsiveness of extension worker | Poor willingness to respond | Motivated to respond due to keep up the job. |
| Accountability of extension worker | Less accountability | High accountability |
| Access to extension service | Unequal access due to lack of physical and geographical proximity | Easily accessible due to existence within farmer reach |
| Quality of the advice | Usually better than FBO-based extension | Not better than public extension in many cases. |
| Clinical facility | Good clinical facilities | Poor clinical facilities |
| Input sell | No input sell | Sell inputs on fair prices |
| Continuity in extension services | Sporadic, when runs on project basis | Continues on self-sufficient fund as long as the organizations exist |
| Cost in accessing emergency service | Higher than FBO-based extension in many cases. | Lower than the free public extension services as the services are available at community level. |
| Coverage of services | Scattered national coverage | Intensive local coverage. |
| Services' orientation | Pre-planned services | Commodity and market oriented services |
| Organizational structure of extension | Well-structured | Poor infrastructure facility |
| Threats against effectiveness and efficiency | Corruption, internal and external politics, fund shortage, etc. | Corruption by group leaders and market shrinkage |

*Source: Adapted from Rashid and Gao [13]*

home [8]. In this dilemma, there can be two tentative alternatives for the development of dairy farmers. The first alternative might be making public extension available to farmers' close proximity, and the second possible alternative can be encouraging the FBO extension where farmers can share a proportion of extension service charge. However, the first one is hardly possible as the government is not in a position of allocating huge budget for livestock extension service, while the second one is comparatively convenient but need appropriate policy realization and manifestation.

## 7. CONCLUSION AND RECOMMENDA-TIONS

Smallholder dairy farming is emerging as a new method for sustainable livelihoods in the rural areas of developing countries including Bangladesh [85]. Increased population pressure, climate change and global technological revolution have led to transition in farming systems, which has provided the room for smallholder dairy development in Bangladesh. Accordingly, faster development calls for strengthening the traditional dairy extension services. However, Globally, State extension is facing a funding crisis [4] in trying to increase its coverage. Consequently, the smallholder producers are gradually being excluded from the desired services [23]. Moreover, poor service quality of State extension has led to the growth of paid community-based extension services. The inadequate, infrequent, and less-efficient State extension services is a crucial problem for dairy development in Bangladesh. Low productivity, poor market and value chain of milk, high price and low quality of inputs in the market suggests the other major problems of smallholder dairy development in Bangladesh. In addressing a majority of these problems, promoting community-based extension can be a good solution. Smallholder farms and community-based dairy extension has been proven as a successful model in the dairy belt of Bangladesh and India. There is no reason that it cannot be replicated in other places of the country [24,8].

Although varieties of farmer-based extension exist at home and abroad, most of them have been formed according to the interests of outsiders. Producer organizations, as a result, have failed to play the role of a true autonomous civil society. Milk producers' cooperatives need to be empowered with distinct common interest groups, honest and efficient leadership, and adequate business orientation to achieve control

over the extension systems and to make them demand driven. A clear national dairy extension plan, together with district-level cooperatives, may play a pivotal role to facilitate the autonomously formed dairy cooperatives at the village level. Government through its Ministry of Cooperatives and Agricultural Bank can provide low interest rate credit facility to the cooperatives for establishing milk processing plants at community level. Nonetheless, a cooperative needs to be conscious enough to develop their own funds for the maintenance of the processing plant, giving wages to staff and paying back the bank credit. Application of ICT, smart phone use for example, in delivering and accessing digital advisory services can increase the utility of FBO-based extension and improve livelihoods of smallholder dairy farmers.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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