

RESEARCH PAPER

## Farmers' willingness to pay for veterinary extension services and effects of paid services on livelihood outcomes: A study of community-based smallholder dairy of Satkhira region of Bangladesh

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### ABSTRACT

The focus of this study is to narrate the farmers' willingness to pay (WTP) for the dairy veterinary extension services. The study also aims at unveiling the effect of paid services on livelihood outcomes of the smallholder dairy farmers. In this regard, 255 randomly selected farmers of community-based dairy veterinary foundation (CDVF) were interviewed. Moreover, qualitative approach like key informant interview, focus group discussion and case study were adopted for achieving triangulation in findings. Study revealed that farmers were willing to pay because the services are cheap; 24 hours available in farmers' community and friendly delivered at farm gate. Alternatively, farmers were bothered due to inconvenience in accessing the public extension services which were inadequate too. Community-based extension services have increased the production, income and employment of the smallholder dairy farmers which in turn have brought several positive outcomes in their livelihood. Livelihood outcomes varied due to variation in farm economic factors, paid extension factors and personal factors as well. The community-based paid extension model of this study deserves dissemination throughout the country for promoting rural livelihoods.

**Key words:** Community-based extension, livelihood outcomes, smallholder dairy.

### Introduction

Being a small delta, Bangladesh is passing with challenges of achieving food and nutritional security goal in the face of increasing population growth. However, the scope of homestead dairy is opening with decreasing the crop land and bull-driven tillage. Smallholder household dairy, as a result, beacons a good prospect in rural livelihood, nutritional security and economic development as well (Uddin et al., 2016a). Smallholder dairy contributes about 80 percent in national milk production (Uddin et al., 2011). The present milk consumption status in Bangladesh is 52 g/person/day (Uddin et al., 2011). Yet there is wide gap to reach the requirement 250 g/person/day (Hemme, 2010). Hence, the future would certainly demand more milk production and supply in Bangladesh. Therefore, the present potential and future demand call for a robust extension support for the smallholder dairy farmers of Bangladesh.

Agricultural advisory services, around the globe, have long been playing a decisive role in achieving better rural livelihood, food security and environmental-

sustainability. In Bangladesh, about 480 Upazilla Veterinary Hospital (UVH) is the one-stop center of veterinary services for all sorts of livestock farmers at grass root level. Lamentably, the ratio of veterinary doctor and animal population is very low; 1: 150,000 approximately. In most cases, farmers need to count their coin in accessing the free public extension services at home (Uddin, 2015). The reality has excluded large sections of smallholder farmers from government extension services particularly in remote rural areas. Consequently, those farmers are served by paid extension agents like veterinary consultant, paravets and outright veterinary quack. Others are served by NGOs and private dairy companies. The NGO-based extension services are donor project-based where the private milk companies are highly profit-oriented. The most limitation of state extension service is failure to link the farmers with profitable milk marketing channel which, otherwise, is served by market-oriented community-based or farmers-based organizations (Uddin et al., 2016a). Therefore, achieving sustainable livelihood by extension intervention deserve pluralism in extension

delivery. For better coordination or collaboration with public extension, the private extension need some form of institutionalization like community-based paid extension. Right now, very little is known about the nature of community farmers' willingness to pay for the dairy veterinary services and its effects on smallholder dairy farmers livelihood. Therefore, this study proceed with the aims of investigating the community farmers' motivation and pay capacity for paid-dairy veterinary services and to record the livelihood outcomes of the intervention trajectories.

## Methodology

Community-based Dairy Veterinary Foundation (CDVF) was selected as a case of Community-based Paid Extension (CPE) to investigate the objectives. CDVF is a new paid extension model in dairy veterinary field. The model has been developed by Bangladesh Agricultural University, Mymensingh. Initially the model offered free services with donor funding support. Since 2009, the model is offering paid service to the smallholder dairy association. The total client size of CDVF is now 4000 smallholder dairy households throughout Bangladesh. CDVF has its four regional offices in Mymensingh, Chittagong, Sirajgonj and Satkhira district. However, Satkhira milk producing and marketing association was selected purposively as the field of study. It is because, Satkhira is the origin of CDVF activities and sufficient numbers of smallholder dairy farmers belong to this association. This association consisted about 1275 smallholder dairy farmers which have been considered as the population of the study. However, 20 percent of the population was selected randomly following simple random sampling method. Thus, the actual number of the sample was 255.

This research followed the revolutionary mixed method approach (Johnson et al., 2007) as strengths of one method minimize the weaknesses of other methods. It brings triangulation (Sandelowski 2003), maintains consistency and upholds robustness of the described findings (Chow et al., 2010; Creswell & Clark, 2006; Clark, 2005). Tashakkori & Creswell (2007) argue that mixed method is a 'new third way' in the era of research methods. Whatsoever, for collecting the qualitative data this study accommodated the snowball sampling as Hoque (2012) did in his research.

Farmers' Willingness to Pay (WTP) for the dairy veterinary services was explored through qualitative assessment rather than the contingent valuation method (CVM). Farmers age, sex, level of education, length of paid extension service, distance of community extension center, communication intensity with community extension, daily milk production at farm, return to labour, farm profit, annual farm and off-farm income, and changes in livelihoods assets were assumed the factors affecting livelihoods outcomes. These factors were measured through appropriate scale that can be found in Table 1. The livelihoods outcomes of CPE intervention were measured through nominal assessment of livelihood outcome indicators using a checklist.

A structured interview schedule was prepared for data collection from the smallholder dairy farmers. Before collecting data the interview schedule was pretested to achieve valid and reliable data. Qualitative data were derived through 15 key informant interviews, 2 case studies, 1 PRA and numbers of informal observation. The farmers' leader, extension personnel and other stakeholders like milk carriers and buyer's representative were chosen as the key informants of the study. However, before going to key informant interview the researchers prepared a semi-structured questionnaire as interview guide. Data were collected from the respondent by the researcher themselves during March 2014 to June 2014. The computer software SPSS (Statistical Package for Social Sciences) 16.0 version was used to analyze the quantitative data. Descriptive statistical such as frequency, percentage, mean, mode, standard deviation, etc. were used to interpret the data. Factor analysis was administered through Principle Component Analysis (PCA) with varimax rotation method following Olawale & Garwe (2010). PCA was used to assess the contribution and categorize the factors determine livelihood outcomes. In contrast, thematic approach was used to analyze qualitative data.

## Results and Discussion

### Salient Features of the Factors Affecting Farmers' Livelihood Outcomes

The data presented in the Table 1 show that most of the farmers were in their middle age. Male farmers dominate in smallholder dairy. There were only 25 female against 230 male smallholder dairy farmers respondents. Education of most of the farmers was up to primary level. The CPE is offering veterinary services to the community for five years. However, most of the farmers were taking paid veterinary services for two years. Farmers home are scattered up to 12 kilometers from the community extension center. But, density of farm household is high around 3 kilometer of extension center. Usually, the farmers communicate with CPE center in every now and then. The average daily production at those commercial smallholder dairy farms was 12 liters but most of the farmers experienced 7 liters milk. The average daily return of a labour was 333 taka which might be a sign of better livelihood outcome. In case of farm profit, few farmers experienced negative achievements. However, most of the farmers enjoyed more than 30 thousand taka profit in a year. The household income shows that it is about 150 thousand taka per year. In a possible score of 0 to 100, it was found that the most of the farmers hold a score of 65 in case of livelihood assets change. This finding bears a positive sign of livelihood improvements due to CPE intervention.

### Smallholder Dairy Farmers Willingness to Pay for Veterinary Extension Services

The focus of this chapter is to disclose why smallholder dairy farmers of Bangladesh want to pay for the dairy-veterinary extension services privately where the public extension services are provided at free of cost. Measuring WTP in money term was not the priority of

**Table 1. Features of the smallholder dairy farmers under CPE services**

Factors and Measurements	Range Observed	Mean	SD	Mode
<b>1. Age</b> Age of the respondent was measured in full years. A score of 1 was assigned for each year old.	20-80	39.58	10.03	40
<b>2. Sex</b> A score of 1 was assigned for the male respondent and 0 otherwise.	0-1	-	-	1
<b>3. Education</b> Education was measured on the basis of year of schooling. A score of 1 was assigned for each year of schooling, 0.5 was assigned for semi-literate and 0 for illiterate.	0-15	5.76	3.53	2
<b>4. Length of Paid Service</b> It means duration of service purchasing by the farmers. A score of 1 was assigned for each year.	1-5	2.78	1.22	2
<b>5. Distance of Community Extension Center</b> It is the space between farm and community animal health center. The distance was measured in Kilometer (Km).	0.5-12	5.82	2.92	3
<b>6. Communication Intensity</b> It means the extent of interaction between farmers and community extension providers. The intensity was labeled as frequently, now and then, seldom and never with a corresponding score of 3, 2, 1 and 0.	0-3	1.78	.61	2
<b>7. Daily Milk Production at Farm</b> Daily milk production of the smallholder dairy farmers was measured in Liter. A score of 1 was assigned for each liter of milk.	1-50	11.61	10.35	7
<b>8. Return to Labour</b> It was calculated by dividing the total return with the total number of labour engaged in the farm. Total return was achieved by summing the return from milk sales, return from animal sales and return from manure sales. Return to labour was expressed in taka/day. A score of 1 was assigned for each taka.	80-1405	333.36	251.81	85
<b>9. Farm Profit</b> Farm profit was calculated by deducting the total cost from total return. Total cost was calculated by summing the price of cow, variable cost, cost of paid labourer, capital loss, interest on loan and other miscellaneous cost. It was expressed in thousand taka per year	-45-120	32.81	24.07	31
<b>10. Annual Farm and Off-farm Income</b> Annual household incomes from all sources were considered. A score of 1 was assigned for each thousands taka.	76-426	149.47	80.70	122
<b>11. Change in Livelihoods Assets</b> It was measure by a five point Likert scale. Twenty five statements were set for all five types of livelihoods assets. A score of 4, 3, 2, 1 and 0 was assigned for agreement with highly increased, increased, unchanged, decreased and highly decreased.	42-93	66.97	10.58	65

this study. Because, the amount of WTP is already known in CDVF model of dairy-veterinary extension that can be found in Figure 1. Alternatively, the study explored the hidden causes of farmers' motivation to pay for the services.

The free public extension systems cannot cover the whole farm territory due to staff and fund shortage. Moreover, insincerity of public extension personnel and changing demand of service turned the smallholder dairy farmers towards paid extension system. The public livestock extension service is neither free nor demand driven. One of the paid veterinarians of CDVF said "It is very difficult for a farmer to bring sick cattle to UVH. The more difficult is to call a veterinary doctor at home. They only visit during office time but not at free of cost. A veterinary surgeon bears two assistant. Even, very often he does not check health condition of the cattle.

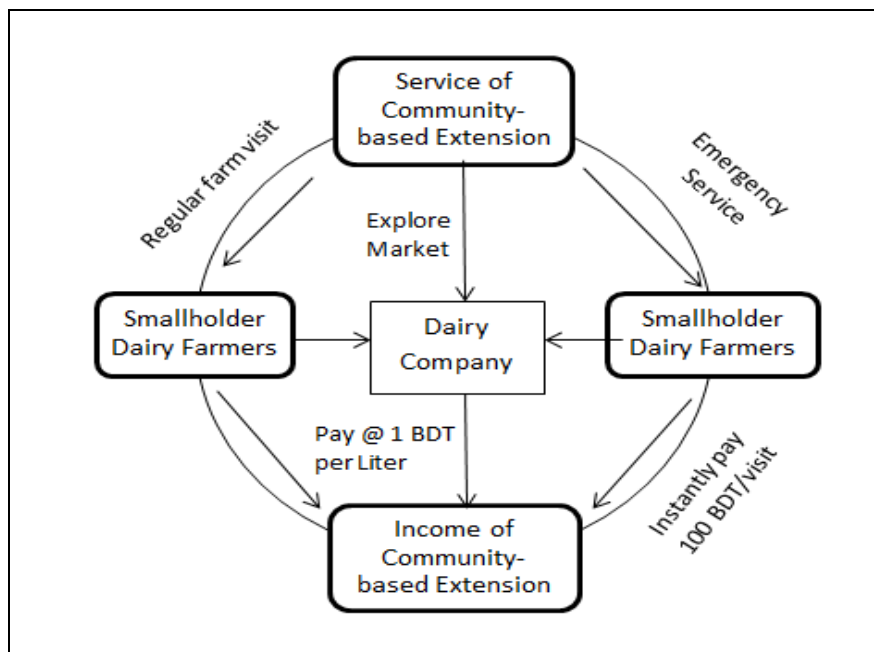
*The assistants do everything and the fop doctor takes seat. At the end the assistant charges 500 BDT. Farmers' heart sink when see the figure, but nothing to do. When the health condition of the sick cattle becomes aggravated at night, farmers do not get them even with money. These situations turned them towards private service".*

Farmers nowadays want continuous quality extension service at farm and/or home. Their willingness to pay depends on the amount of capital invested together with probability of making profit (Uddin et al., 2016b). The client dealing manner of public extension staff cannot make the farmers happy due to many reasons. The community veterinarian added that- *as a paid extension worker, I set my mind as friend of farmers. I live on farmer's money. I must respond to*

farmers call at any time. Although I am a veterinary surgeon too; I go with close contact of animal, try to feel the problems and prescribe according to my experience. I will not say I am very efficient to make round the cattle. But, I make farmers anxious free with my conduction. At mid night, if a cross breed dairy cow gets sick, farmers become puzzled. If a cross breed dairy cow gets sick, farmers-become puzzled. If a cow dies, they cry as if their son died. Therefore, I try to respond even at mid night. These make them confident that I am with them in their emergency. The emergency fee is only 100 BDT but sometimes they offer more than that.

Many researchers would argue that in a poor and agrarian country extension service should not be privatized or paid. Moreover, equity issue of smallholder should be considered who do not have enough capacity to pay. In this sense, the community-based paid extension service to the smallholder dairy farmers is quite fair. This is actually a cost-sharing approach where dairy companies partly pay service fee. These smallholder dairy farmers have good daily income from milk. Moreover, they only pay for emergency extension visit which is even less than the public extension's emergency visit. Service charge for regular visit is paid by dairy companies at the end of the

month. Service charge of a farmer is calculated based on the amount of milk sold to the buyer companies in a month; the rate is 1BDT/Liter. There is an agreement with milk companies to buy milk on fair price from the farmers' community (Figure 1). The milk collection at community milk point also saves farmers' economic hour. Therefore, this paid approach has gained popularity among the smallholder dairy farmers. The community-based paid extension service reduces vulnerability and increases income of the smallholder dairy farmers. Therefore, farmers are being interested in paying for the quality services. The service provided by CDVF is very good and cheap. The paid service is profitable to them. A leader farmer of dairy cooperative expresses his happiness to paid system as- "Due to the effort of CPE, I am getting fair price of milk which has increased my farm income. Moreover, the veterinarian takes good care of our animals and advises us a lot about modern dairy farming. As a result, a change in dairy husbandry practices has happened. The public veterinary service is even more expensive than this private service. The public veterinarians do not tell us the actual problems of our cattle. The peon of public UVH acts as a broker and sometime acts as a doctor. In a word, public service is neither free nor standard.



**Figure 1. Service Charge Payment System in Community-based Dairy Extension**  
 Source: Developed by authors

Therefore, CPE is convenient for me. I pay money with pleasure."

Convenience in accessing service is one of main reason of choosing paid extension service. Farmers like farm gate extension delivery rather than office gate delivery. A motivated farmer said- I am buying paid service from CPE for more than four years. By this time the extension workers became familiar as like as our friend. It takes two to three days to get a government veterinary doctor

at home. I have to go physically to call the government veterinarian. It is risky for the sick animal to delay because it may die. It is also bothering for me to contact physically and wait until his convenience. I just call our community veterinarian and he responds physically and quickly. It reduces my risk and uncertainty. So, I do not care in paying this little money for the valuable service. However, an opposite picture was also seen. When the community extension worker do not treat all the farmers

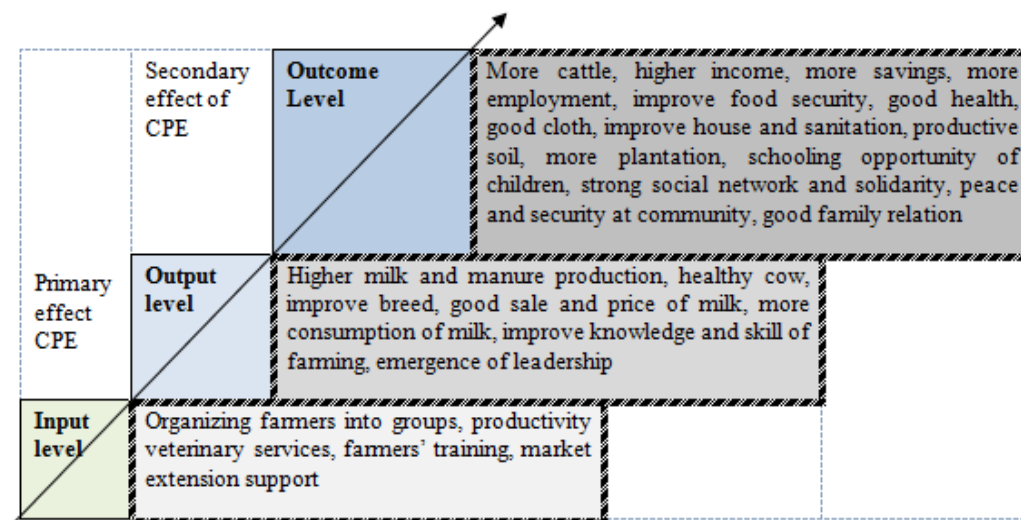
equally or favours someone special, the other farmers become disappointed. This disappointment demotivates them to participate in CPE. Absenteeism of insincere community veterinarian also displeased the dairy farmers. After all, farmers are willing to pay in a situation where uninterrupted service is delivered at home with sufficient counseling opportunity with the veterinarian.

**Effect of CPE on Livelihood Outcomes of Stallholder Dairy Farmers**

The smallholder dairy farmers have achieved many positive livelihood outcomes as a result of CPE intervention (Table 2). In assessing livelihood outcomes the researchers carefully looked at input and output level which helped to understand the ultimate outcomes. At input or intervention level, CPE organized the smallholder dairy farmers into groups for empowering them as well as for facilitating the extension work. CPE offered all sorts of productivity veterinary services, training and market extension support to the farmers. As output, farmers observed increased milk and manure production, healthy cows, improve breed, easy milk marketing with fair price, more consumption of milk, better knowledge and management skill and leadership. These output further enhances several outcomes such as increased number of cattle, higher income from milk

sale, more savings, more employment, improved food security, good health, good cloth, improved house and sanitation, productive soil, more plantation, schooling opportunity of children, stronger social network and solidarity, peace and security at community, good family relation etc (Fig. 2). The CPE’s effect in achieving better livelihood outcomes varied with individual experiences. A farmer furnished his experience of successive assets accumulation-interestingly. He said that- *now I am selling milk in a stable market with higher price than before. Therefore, my income has increased greatly. I invested this money to enlarge the farm with improved breeds. Now I have four milking cows and their calves. Every day I sell about 40 liter milk and consume 3 liter milk in family. Since last year, I am doing seasonal rice business by the money earned from dairy. I earned very handsome money by four months.* It has been observed that many farmers are using cow dung in biogas plant. The cow dung and slurry of biogas plant is further used for crop production. As a result, soil fertility as well as productivity has increased. The increased crop production is consumed by human and cattle, provide raw material for household construction and provide cash at sale.

The veterinary and breeding services of CPE have



**Figure 2. Hierarchy of Outcome Assessment**

Source: Developed by the author

brought convenience in farmers’ life. A farmer has cited his experiences in ways that- *due to artificial insemination service we are getting improved breed of cow. As a result, milk production and income has increased. With additional money, I have bought a motor bike which has brought my convenience in emergency response. Due to involvement with association, my network with different information sources has been stronger.* CPE has effect on employment generation at varied scale. For example, it has provided job for all dairy farmers. Moreover, about 90 peoples from farmers’ family are workings as milk carrier. The community veterinarian informed us that

CPE has extended input business and increased credit access for the farmers. More and more unemployed people are engaging in small scale dairy farming seeing the income of their neighbor. As a result the opportunity of input business has been created which made the input available at community markets. As the income of the farmers has increased their capacity of loan payment has also increased. CPE has offered many positive outcomes. For easy and quick understanding of the readers a list of 18 livelihood outcomes are provided in Table 2. It was found that strongly positive outcomes have been revealed in financial capital. A fairly positive outcome has also found in other capitals except the

**Table 2. List of dairy farmers' livelihood outcomes**

Sl. No.	Livelihood outcomes achieved	No. of farmers (N=255)	% Farmers
1	Increased income	245	96.07
2	More employment	255	100.0
3	Improved food security	250	98.03
4	More good dairy cattle	220	86.27
5	Better savings	225	88.23
6	More schooling of children	235	92.15
7	Good health	195	76.47
8	Better clothing	190	74.50
9	Good sanitation	183	71.76
10	Improved housing	185	72.54
11	More physical assets	254	99.60
12	Input availability in local market	204	80.00
13	More organic plantation	178	69.80
14	Improve soil productivity	143	56.07
15	Soil erosion control	130	50.98
16	Stronger social network	248	97.25
17	More peace & social security	189	74.11
18	Better family relation	218	85.49

natural. However, in consideration of sustainable environment, the outcomes in natural capital such as improved soil fertility, intensive vegetation etc are very important. A sage farmer at the end of interview said that *“be it paid or free service, or be the outcome is great or little, nowadays dairy farming is not possible without veterinary extension services”*.

#### **Factors affecting Livelihood Outcomes of the Smallholder Dairy Farmers**

Based on literature review, analysis of sustainable livelihood framework, analysis of CDVF model of community-based paid extension and observation of field situation the researchers have assumed some 11 number of factors as the determinant of smallholder dairy farmers' livelihood outcomes. Principle Component Analysis (PCA) with varimax rotation method was operationalized to extract major components of those factors. Kaiser-Meyer-Olkin (KMO) test and Bartlett test of Sphericity was employed to test the feasibility of factor analysis. The KMO (0.904) value greater than 0.6 indicates that sampling adequacy is significant (Leech et al., 2005). The value of Bartlett test of Sphericity is significant at 0.000 levels of probability (Table 3) which also ensure the normality of data and robustness of the model. To reduce the factors into a rational number of component Eigen value  $\geq 1.0$  was assumed.

The result of the PCA presented in Table 3 shows that 3 extracted components revealed Eigen value more than one. These three components cumulatively explained about 74 percent variation. The rotated component matrix of Table 4 shows that component 1 sorted five factors with values more than 0.5 which are daily milk production (.89), return to labour (.92), farm profit (.94), annual household income (.75) and changes in livelihood assets (.94). These five factors can be labeled as farm economic characteristics which collectively explained about 54 percent variation. It is rationale that in a dairy-based livelihood, the farm economic factors should have significant contribution to livelihood

outcomes. Similarly, the second component extracted three significant factors which are length of paid service (.65), distance of community extension center (-.61), and communication intensity with CPE (.66).

These factors can be labeled as service characteristics of CPE. These three factors cumulatively explained about 10 percent variation in livelihood outcomes. Though the variation seems little, it has chronic and far-reaching impact. It is assumed that only the primary effect of CPE is realized instantly.

However, distance was negatively loaded in explaining livelihood outcomes. It means that farmers who live far away from the CPE center experienced poor livelihood outcomes. It is true that distance is a significant factor in delivering the quality extension service timely. This finding is congruent with findings of willingness to pay that farmers are motivated if the service is delivered at farm gate; motivation is less otherwise. Uddin et al. (2016b) in a study with crop farmers of Bangladesh also found similar results regarding WTP for extension services. Hellin et al. (2007) found that the paid dairy extension service has positive impact on livelihood. Both the geographical and financial capital had been improved by means of selling better quality and increased quantity of dairy products, increased consumption of dairy products and through achieving self-esteem working with extension agents.

The third component extracted three items. These were age, sex and education level of the respondents. These factors can be labeled as personal characteristics of the farmers. These factors cumulatively explained more than 9 percent variation in livelihood outcomes. Dairy farming is a labour intensive agriculture. Therefore, educated and adult male is helpful for a profitable dairy farming. Male has a number of conveniences over female farmers in, access to cash assets, access to technologies, access to extension services and access to profitable market. In stereotype society of Bangladesh women has less scope to gain experience by expositors. Educated farmers, on the other hand, are enlightened

**Table 3. Total variance explained**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.978	54.343	54.343	5.978	54.343	54.343	5.923	53.843	53.843
2	1.146	10.418	64.761	1.146	10.418	64.761	1.138	10.344	64.187
3	1.009	9.177	73.938	1.009	9.177	73.938	1.073	9.751	73.938
4	.665	6.049	79.987						
5	.609	5.537	85.524						
6	.554	5.032	90.555						
7	.471	4.283	94.838						
8	.307	2.786	97.625						
9	.139	1.260	98.885						
10	.091	.829	99.714						
11	.031	.286	100.000						

KMO=.904, Approx. Chi-Square of Sphericity=2.327, df=55, Sig.=.000

**Table 4. Rotated Component Matrix**

Factors affecting farmers' wiliness to pay	Component		
	1	2	3
Daily milk production at farm	.890		
Return to labour	.922		
Farm profit	.948		
Annual farm and off-farm income	.750		
Change in livelihoods assets	.945		
Length of paid extension service		.650	
Distance of community extension center		-.615	
Communication intensity with extension center		.667	
Age			.931
Sex			.962
Education level			.819

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization

and good decision makers in choosing livelihood strategies (Uddin et al., 2016b; Pervez et al., 2015).

### Conclusion

Smallholder dairy farming has been emerged as a profitable livelihood option in rural Bangladesh. With the development of this sector, the need for dairy veterinary extension service is increasing congruently. However, quality of existing public and private extension, particularly the quack-based veterinary extension, is not satisfactory. Moreover, the service is

out of access to many farmers. In this context, community-based paid extension approach has shown the smallholder dairy farmers a profitable livelihood. Farmers are willing to pay for the services because the services are cheap, available in community and uninterrupted. The veterinary, breeding and market extension services of CPE has brought a numbers of positive livelihood outcomes in farmers livelihoods. The most mentionable are income enhancement, farm enlargement, more savings, more employment, improved

improved food security, schooling opportunity of children, good health and sanitation and a stronger social network. It has been found that farm economic factors, CPE factors and personal factors significantly explain the variation in livelihood outcomes. Though the effect of farm economic factors have much influence, as compared to the CPE factors, in explaining the variation in livelihood outcomes; in reality, it would be difficult to ensure better livelihood outcomes when the economic factors functions alone. Therefore, this study recommends that dissemination of such a low-cost dairy veterinary extension model deserve dissemination throughout the country. Government in this connection should take proactive policy for the growth of this innovative extension model.

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