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Livelihood Adaptation Strategies of the Resource - poor Women through Chicken, Duck and Goat Rearing in Bangladesh

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Abstract

An action research (AR) was recently conducted in Mymensingh and Netrokona districts of Bangladesh to explore the potentialities of keeping improved breeds of chicken and duck as well as Black Bengal goat by the rural poor. Accordingly, 32 poor households (women) were selected for the study. The livestock income was about 11% of total household income and this stock was reared by the household women. This income was mainly spent for house repairing, children education, clothing of family members, purchasing day-to-day basic needs of households, savings for reinvestment and also to increase animal stock. The houses were mainly repaired by goat keeping households. Having received new dress and relatively better financial support from the poor parents, their children were more interested and willing to go to school regularly. In fact, these poor parents had no capability to send their children to schools due to severe financial constraints in the households. It was revealed from the results of probit model that the better educated mothers invested more money earned from livestock farming for education purposes of their children. In addition to livestock farming, the women, who worked outside of their houses were found more dynamic and spent relatively a greater proportion of their income for children education compared to those women, who usually worked at home. The livestock income gave them (women) better opportunities to perform different economic activities, which also increased

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their social mobility. Their social status was far better than ever before due to better financial solvency, which was the clear indication and/or direct contribution of small-scale household livestock farming. Realizing the benefit of the chicken, duck and goat rearing, the government and non-government organizations should come forward and take all possible initiatives for keeping such improved livestock breeds by the rural poor. This livestock farming could be one of the most appropriate ways to alleviate poverty for poor households, more particularly the women headed households in Bangladesh.

1. Introduction

Agriculture had the biggest share (21.59 percent) to gross domestic product (GDP) in Bangladesh in 2009/10, of which, livestock sub-sector shared 11.21 percent and was the 3rd largest contributor to agricultural GDP (BBS 2011). It provided 15.0 percent of total employment and 39.0 percent of agriculture employment in the economy of Bangladesh (BER 2005). During the last decade, a large number of government and non-government organizations (NGOs) worked to develop this sub-sector and a huge amount of credit was also disbursed (CDF 2001, DLS 2006 and BB 2003) but, like other sub-sectors (crops, fisheries, leather etc), the growth rate of livestock sub-sector was not satisfactory as expected (Quasem 2005). On the other hand, the demand for livestock products has been increasing day by day in the World as well as in Bangladesh. The commercial livestock farming has gradually been increasing, but due to urbanization the small scale livestock rearing has been decreasing over time at household level (Delgado *et al.* 2001). The livestock sub-sector is projected to be the most important sub-sector in coming days in terms of added value and land use (De Haan *et al.* 2001). By realizing the situation, effective initiatives to develop the livestock sub-sector would be challenging but appropriate to meet the increasing demand of livestock products.

Most of the 1.5 million people (75 percent) of the world are extreme poor and about half of them directly or indirectly depend on livestock (Thornton *et al.* 2002). In Bangladesh, 40.4 percent of the households are categorized as poor and most of them live in rural areas (HIES 2007). The half of these poor households raise indigenous breeds of livestock in rural areas and they raise livestock in local scavenging system (Sarwer 2011). Among the poor, the households headed by women in rural areas are more likely to be poor (Lawson-McDowal 2001).

The scientists recently released improved breeds of chicken (Faomi, Sonali and Nera Brown) and duck (Xinding), which are possible to rear at small scale by

households in rural areas. More numbers of egg laying by the improved breeds of chicken and duck compared to indigenous breeds are already proved and recommended (Amin 1992). Rearing of the improved breed of chicken and duck would possibly be the easiest way of meeting the demand for livestock products. Rearing of the well recognized Black Bengal goat is also the specie for meeting livestock products demand. The livestock rearing would also be the tools for poverty alleviation and income generating activities for the poor. The women could easily take responsibility to rear small stock livestock in rural areas. But the potentialities of these three species are unknown to the local poor and, moreover, this situation is more severe for rural women. To explore the potentialities of how these three species can improve the livelihood of the poor, was the major theme of this study.

2. Methodology of the Study

Action research technique was undertaken to explore the potentiality of chicken, duck and goat to the poor in rural areas. Three locations namely: (i) Chariswardia village of Sadar Upazila in Mymensingh district; (ii) Charbogra village of Muktagachha Upazila in Mymensingh district; and (iii) Thakurakona village under Sadar Upazila of Netrakona district, were selected for conducting action research. The farm households which were very poor having a wider experience in livestock keeping were selected purposively for action research.

It was recognized that a significant number of scavenging livestock (goats and poultry bird) would not be sustainable because the resource-poor households would not be able to supply adequate feed for the goats and/or poultry birds, and health hazard might be another risk for the poor. The herd size was the important factor to get higher profit from goat farming. A report on the 'semi-scavenging poultry model' (DANIDA, 2002) was recommended for husbandry system. The system involved confinement of a small flock (10 to 12 birds) of indigenous birds, with supplementary feeding, and allowing them to scavenge for the remainder. A research work conducted by Sarwer (2002) on scavenging goats was also reviewed. Finally, 14 pullets plus 1 cockerel or 10 ducks plus 1 drake or 1 adult goat (she) with preferably 1 or 2 kids were distributed to the selected poor households (Table 1). A two-day training on livestock management, vaccination, vitamins, feeding during natural disaster was given to the selected participants and, in addition, technical advice during in each of the fortnight was given and monitoring was done for successful implementation of the program. The poultry birds and goat were distributed to the selected 32 women as 13 for goat rearing, 9 for chicken and 10 for duck rearing (Table 1).

It may be noted that on an average, one year old goat (she) with 2 kids were purchased from local markets as well as the pullets having 1.5 months age were also collected from government farm. Similarly, 6 months old ducks were purchased from non-government commercial farms and distributed among the selected participants.

Table 1: Numbers of Chicken, Duck and Goat Distributed among the Selected Households in AR Locations

Area	District	Goat		Chicken		Duck		Total no. of farmer
		No.	No. of Farmer	No.	No. of farmer	No.	No. of farmer	
Chariswardia	Mymensingh	13	5	45 (+15)	3	11	1	9
Charbogra	Mymensingh	22 (+1)	8	30 (+5)	2	-	-	10
Thakurakona	Netrokona	-	-	60	4	99	9	13
All areas	All district	35 (+1)	13	135 (+20)	9	110	10	32

Note: Figures within the parentheses indicate the number of chicken and goat were replaced because of mortality of the concerned goats/chicken at the early stage of AR.

Data was collected during the period of every fortnight visit to individual action research households. In total, 25 visits were made to each household for data collection during the project year (2005/06). Collection of data for the farming activities over the multiple time periods is called panel data (Wikipedia 2008). The data of this study were the same type of multiple time period data collected over time and considered as panel data. The total observation of the panel data of this study were 800 (32 farmers multiplied by 25 visits). It may be noted that Sirohi *et al.* (1997) collected monthly interval data and used in their study.

A major part of analysis on livelihood was influenced by livestock and poultry rearing, done with the help of multiple tabular analyses. It was assumed that some factors may influence decision making for spending livestock income to purchase food, pay education fees, purchase medicine or make other expenses. Among these, children education was important and potential head of expenditure to improve the human capital of any household. Under the situation, to estimate the probability of the factors influencing decision making whether the households are making expenses for children education or not, the binary probit regression

analysis was applied. To determine the probability of money expenses for children education influenced by some socioeconomic factors, the following binary probit model was fitted.

Prob (Y=1) = $F(ß_iX_i)$

Where, Prob = probability of decision making, Y = 1 (dependent variable), X = Socioeconomic factor, ß = coefficient and i = number of the factors.

3. Results and discussions

The successful AR farmers improved their livelihood in different ways using income by selling eggs from project chickens and ducks as well as goats. Income from small stock made a significant contribution to the total household income: 12 percent from goat, 10 percent from each of the chickens and ducks (Table 2). This livestock income was used in many ways to meet up household needs. Angle *et al.* (2002) also found that livestock contributed to the sustainable livelihood and security of the rural poor in many ways, as natural capital, source of financial capital, and social capital. Livestock also offered the smallholders an efficient source of animal food.

Livestock keepers spent their income mainly for repairing houses, educational expenses for their children, clothing, food consumption, improving nutritional status, kind and cash savings and increasing livestock numbers (Table 3). Livelihood improvement of livestock households has been discussed under the following heads.

Table 2: Annual Household and Livestock Income of AR Households

Types of income	Tk/households/year			
	Goat	Chicken	Duck	All species
Non-livestock income	20687	20198	19564	20269
Livestock income	2866	2273	2273	2529
Total income	23553	22471	21837	22798
% income from livestock	12.0	10.0	10.0	11.0

Source: Adapted from Sarwer (2011, p. 102).

3.1 Improvement of dwelling houses

Farmers in most cases placed emphasis on repairing their dwelling houses, since they were very poor and could not make any good dwelling house due to lack of financial capital. Table 4 shows that about 48.0 percent households repaired their houses but could not make any new house except one beneficiary. On an average,

Table 3: Number of AR Households According to the Nature of

Items	Chariswardia (No.)	Charbogra (No.)	Thakurakona (No.)	All (No.)
Housing	3 (33)	8 (89)	4 (33)	15 (52)
Education	4 (44)	4 (44)	4 (33)	12 (40)
Clothing	9 (100)	9 (100)	12 (100)	30 (100)
Daily household needs	9 (100)	9 (100)	12 (100)	30 (100)
Egg consumption	4 (44)	1 (11)	12 (100)	17 (52)
Savings	2 (22)	4 (44)	6 (50)	12 (39)
Increased stock	4 (44)	9 (100)	3 (25)	14 (44)

Source: Adapted from Sarwer (2011, p. 103).
Note: Figures within the parentheses indicate the percentage of total household of the concerned enterprises

each household spent Tk 424.0 for repairing their houses while the goat selling money contributed some (Tk 1750.0) to build a new house. Mainly the goat keeping farmers (52.0 percent) repaired their houses, since they got a significant amount of money from selling goat at a time. The goat keeping households spent the highest amount of money (Tk 560.0) for improving houses. But, unlike goat households, duck and chicken farmers could not spend money for repairing their houses because no substantial amount of incomes from chicken and duck were earned at a time. These incomes were generated regularly and these were often spent for meeting day-to-day basic needs, mainly food items, of the households (Table 4).

3.2 Affording children education

Chicken and duck keeping farmers sold their eggs regularly and the money was mainly spent to pay school fees, purchasing books, school uniform, etc. Six out of

Table 4: Amount Spent for Making Household Improvement by AR

Type of works	Chicken households		Duck households		Goat households		All households	
	No.	Tk/year	No.	Tk/year	No.	Tk/year	No.	Tk/year
Repairing houses	2	420	2	350	10	440	14 (48%)	424
Making new houses	0	0	0	0	1	1750	1 (4%)	1750
Total	2	420	2	350	11	560	15 (52%)	513

Source: Adapted from Sarwer (2011, p. 104).

8 duck households and 5 out of 9 chicken households spent for their children education. Except one, the goat households did not spend for children education as they had no regular income from goat. The women farmers felt proud that they were meeting the demand of their children without any external help or help from their husbands. Their children expressed willingness to go to school since their parents were better off and paid their fees regularly. Even they gave a little amount of money for purchasing snacks to their children during the leisure period of school (Table 5).

Table 3 confirmed that around 40.0 percent households in the study areas made expenses for their children education. This was a great enhancement to their children to support for education and inspiration for going to school regularly. The

Table 5 : Amount Spent for Educational Purposes of Their Children by Utilizing AR Project Money

Types of works	Chicken households		Duck households		Goat households		All households	
	No.	Tk/ year	No.	Tk/year	No.	Tk/year	No.	Tk/year
School feed paid	3	55	3	42	0	0	6	49
Purchasing paper, pencil etc.	6	80	5	76	0	0	12	72
Purchasing uniform	2	210	1	160	1	180	4	190
Allocation for school tiffin	6	128	5	93	0	0	12	103
Total	6	306	5	226	1	180	12	262

Source: Adapted from Sarwer (2011, p. 104)

households spent money for children education, school fees, purchasing education materials, making school uniform and for school tiffin (Table 4). In fact, some households did not spend any money for education purposes of their children. Some factors might have influenced the AR households to take decision for spending money for children education. So, it was of interest to identify the factors which might have influenced some households for not spending any money for education of their children and in this regard the probit regression function was fitted as discussed below.

Factors affecting expenses for children education. In the present study, the point of interest is to assess the probability of rural farm households' participation in spending money for children education, which was one of the vital indicators that contributed much in changing livelihood. So, to assess the participation in

expenses for children education, probit model was fitted. A rural household either spent money for children education or not. Since the step was to determine the probability of the factors of rural farm households for allocating the money for children education, the following probit regression model was used. Heckman (1976) used the probit regression at first in his study.

Probability of making expenses for children education (Yes = 1, Otherwise = 0) = $a + ß_1$ (Age) + $ß_2$ (Education) + $ß_3$ (Family size) + $ß_4$ (School child)+ $ß_5$ (Homestead area) + $ß_6$ (HH income) + $ß_7$ (Benefit livestock) + $ß_8$ (DLoc1) + $ß_9$ (DLoc2) + $ß_{10}$ (DOcc) + $ß_{11}$ (DSpc1) + $ß_{12}$ (DSpc2)

Where,

There was no significant regional effect for variation of expenses for children education. The women, who did more work (apart from homework) might have more probability to spend money for education purposes as they might be more

Prob Y	=	Expenditure for child ren education (Yes=1, No=0)
Age	=	Woman's age (livestock owner) (year)
Education	=	Womam's education (year of schooling)
Family size	=	Family size of household (No.)
School child	=	Existence of school going c hildren in household (Yes=1, No=0)
Homestead area	=	Homeatead area (deci mal)
HH income	=	Annual household income (Tk/household/year)
Benefit livestock	=	Return from livestock (Tk/year)
DLoc1	=	Location dummy1 (Chorbogra village=1, otherwise=0)
DLoc2	=	Location dummy2 (Chariswardia village=1, otherwise=0)
DOcc	=	Occupation dummy (Homework =1, otherwise=0)
DSpc1	=	Species dummy1 (Chicken=1, otherwise=0)
DSpc2	=	Species dummy2 (Duck=1, otherwise=0)
a	=	Intercept
ß	=	Coefficient
i	=	Number of farms

diversified than the women who did not perform any job other than domestic work. Chicken and duck rearing household farmers had better chance to spend for education purposes than those of goat keeping households due to their regular income from egg selling. Younger women might have a higher probability to spend for education than the older women. In the case of AR households, there

was no significant effect of the education level of women on money allocation for children education because there was not much variation in education levels of the AR women. It may be noted that the inclusion of more number of households in further new study may give different results for the variable. More earnings from livestock given a chance to spend more for children education. But there was no better probability to spend more for children education by bigger landholding households as well as households having higher income (Table 6).

The log likelihood function and the proportions of samples correctly predicted for their likely status in terms of expenses for education indicate a good fit of the equation.

Table 6: Factors Influencing the Probability (Results of Binary Probit Model) of Expenses for Children Education

Variables	Coeffi cient	St.error	b/st.Er	P[|Z|>z]	Mean(X)
Dloc1 (Charbogra=1, otherwise=0)	-0.124	1.107	-0.112	0.9108	0.3125
Dloc2 (Chariswardia=1, otherwise=0)	-0.264	1.089	-0.243	0.8080	0.2812
Docc (Homework=1 , otherwise=0)	-1.655	0.865	-1.913	0.0558	0.7500
Dspc1 (Chicken=1, otherwise=0)	1.838	1.339	1.372	0.1700	0.2813
Dspc2 (Duck=1, otherwise=0)	2.309	1.533	1.506	0.1321	0.3125
Age of owner (years)	-0.116	0.470	-2.478	0.0132	36.00
Education of owner (year of schooling)	-0.039	0.151	-0.255	0.7989	1.219
Family size (no.)	-0.019	0.302	0.063	0.9500	3.719
Child able to go to school (Yes=1, otherwise=0)	2.389	1.153	2.073	0.038	0.781
Homestead land (dec)	0.074	0.064	1.152	0.249	7.094
Benefit from livestock (‘000 Tk/year)	0.55	0.26	2.089	0.036	2.723
Household income (‘000 Tk/year)	-0.0185	0.0667	-0.277	0.781	22.015
Maximum likelihood estimates					
Log likelihood function			-13.00		
Restricted log likelihood			-21.17		
Chi-squared			16.33		
Significance level			0.129		
% correct prediction			60%		

Source: Adapted from Sarwer (2011, p. 107)

3.3 Better clothing

Clothing was an important head of expenditure made by resource-poor households from the earnings of small stock. The AR women bought school uniforms and other clothes for their children by spending Tk 270.0, *Shari* for themselves by Tk 127.0 and *Lungi* for their husband by Tk 100.0. The households

usually gave emphasis to purchase clothes for children and *Shari* for women. On an average each household spent Tk 247.0 for purchasing clothes for family members using income from project animal (Table 7). When there was no income from livestock, the uniforms and *Sharis* were purchased by spending their husbands' earnings, which was really a burden to bear from very limited household income of the poor husband. Obviously, these earnings from small stock reduced their husbands' burdens and made them more responsible to their household expenses.

Increasing capability of daily household foods

Regular income from eggs created an opportunity for chicken and duck households to buy daily family foods such as rice, salt, potato, chili, onion, oil, spices, etc. A total of Tk 432.0 per year was spent to purchase the daily foods by each AR household. The highest number of households (21 out of 30) purchased

Table 7: Number of Households Purchased Clothes by Using Project Animals Income

Types of works	Chicken households		Duck households		Goat households		All households	
	No.	Tk/year	No.	Tk/year	No.	Tk/year	No.	Tk/year
Clothe for the wife	5	126	5	112	7	138	17	127
Lungi for husband	2	95	0	0	2	104	4	100
Clothe for children	4	248	4	213	11	274	18	270
Total	8	227	9	157	13	322	30	247

Source: Adapted from Sarwer. (2011, p. 108).

coarse rice from local shop, costing altogether Tk 326.0, which was the largest share amongst the daily food items. Ten out of 30 households also bought fire oil (Table 8). The AR women were able to make some purchase from their own income, whereas previously they had to depend on their husbands for money. The chicken and duck households sold eggs regularly to local grocery shops, which were located in nearby sub-urban area (Chariwardia) and purchased the daily foods from those shops. Sometimes, they purchased goods on credit and later on payment was made by supplying eggs regularly to the concerned shops. Local marketing facilities ensured eggs selling, which made the project women more active and efficient in their farm activities. Goat households purchased coarse rice when they sold goats. In fact, their overall food consumption has relatively increased during the AR period compared to before project period.

3.5 Egg consumption

Generally chicken and duck farmers sold eggs regularly (Table 9). Sometimes, eggs were consumed by the family members. The highest number of eggs (48 eggs per year per household) was consumed by family children following by male adults and female adults. The adults preferred to give more eggs to their children. They knew that egg was the source of high quality protein and nutrition especially

Table 8 : Number of Households Purchased Daily Food Items by Using Income from Project Animal

Major item of goods purchased	Chicken households		Duck households		Goat households		All households	
	No.	Tk/year	No.	Tk/year	No.	Tk/year	No.	Tk/year
Coarse rice	5	180	3	165	13	420	21	326
Potato	8	72	9	64	0	0	17	68
Chili	8	60	8	48	0	0	16	54
Dal (pulses)	8	142	2	142	0	0	10	142
Salt	8	35	8	31	0	0	16	33
Onion	6	62	4	32	0	0	10	50
Edible oil	6	84	8	71	0	0	14	77
Fire oil	4	70	6	67	0	0	10	68
Total	8	566	9	343	13	420	30	432

Source: Adapted from Sarwer (2011, p. 109).

for the pregnant women and for improving the cognitive skills and mental growth of children. Previously they could not purchase eggs due to lack of money. It was almost impossible to purchase eggs for children and themselves. Table 9 shows that only chicken and duck households increased egg consumption as they produced eggs at home. Due to own production of eggs, they consumed more eggs than ever before. They also offered eggs to their relatives when they visited their house. Egg is the most prestigious food item for relatives of the poor.

3.6 Employment generation

Providing labour for small stock was not a problem. Female members of the family gave maximum labour for rearing chicken, duck and goat. They were more occupied during AR study. Men and children also helped in small stock keeping. The AR women worked 14.17 man-days per year for livestock keeping. They worked 0.53 hour per day for livestock keeping. Their children employed the second highest time 0.39 hours per day for rearing animals (Table 10). Involvement of male family members in chicken and duck rearing was comparatively low. But a significant number of male participation was found in

Table 9 : Number of Households and Number of Eggs Consumed by AR Family Members

Types family member	Chicken households		Duck households		Goat households		All households	
	No.	No/year	No.	No/year	No.	No/year	No.	No/year
Egg consumed by children	8	53	9	43	0	0	17	48
Egg consumed by adult male	8	8	9	13	0	0	17	11
Egg consumed by adult female	8	6	9	7	0	0	17	7
Total	8	67	9	63	0	0	17	65

Source: Adapted from Sarwer (2011, p. 110).

goat rearing due to their intensive involvement for grazing outside homestead area, insemination purposes, feed collection, marketing activities, etc. On an average, 23.83 man-days per year were occupied by all family members for chicken, duck and goat keeping.

3.7 Better health care for family members and livestock

Income received from selling eggs contributed to improvement in health condition of most household members of AR farmers. They usually used this money to buy medicine for some minor diseases of the family members when it was required. Each household on an average spent Tk 345.0 during the project year. A small amount of savings was also made by some women. Five AR farmers used their savings to purchase medicine for animal health care. Earlier they could

Table 10: Use of Labour for Chicken, Duck and Goat Rearing in A R

Enterprise	Male	Female	Children	Others*	Total
		Employment (hour/day)			
Chicken	0.40	0.55	0.31	0.30	1.07
Duck	0.33	0.58	0.39	0.32	1.62
Goat	0.36	0.47	0.48	0.40	1.71
All	0.36	0.53	0.39	0.34	1.47
		Employment (man -day/year)			
Chicken	0.15	11.75	3.52	0.67	16.09
Duck	0.57	13.58	5.19	1.62	20.96
Goat	6.81	17.19	10.18	0.25	34.43
All	2.51	14.17	6.30	0.85	23.83

Source: Adapted from Sarwer (2011, p. 111)
Note: others included mother and father of the family

not spend any money for animal treatment. Savings from eggs and goats were also used to overcome the risk, which had reduced their vulnerability. They purchased medicine and also paid doctor's fee when family members became sick. One goat raising woman, who had 5 goats, spent a substantial amount of money (Tk 2500.0) for treatment of her sick husband. A total of 12 out of 30 households spent their money for medicare of family members as well as for animals, and each household on an average spent Tk 586.0 during AR (Table 11). Moreover, consuming more eggs improved health condition of family members of AR households.

3.8 Improved social status

Income of households of AR farmers increased and as a consequence, their social status also improved. "The rich kicked out the poorest people like a dog", one woman expressed her honest feelings during data collection in the study villages. In other words, they were neglected in society since they did not have enough resources to meet their day to day basic needs. They did not go to neighbours

Table 11: Household Costs for Medicine of Family Members and Livestock by Using Projects Income

Items of cost	Chicken households		Duck households		Goat households		All households	
	No.	Tk/year	No.	Tk/year	No.	Tk/year	No.	Tk/year
Medicine for family members	4	340	1	217	2	420	7	345
Doctor's fee	0	0	1	1800	1	2500	2	2150
Medicine for animal	2	43	0	0	3	76	5	63
Total	6	241	2	1009	4	892	12	586

Source: Adapted from Sarwer (2011, p. 112).

regularly for borrowing money during AR rather some of them sometimes helped neighbours by giving some money as loan. They also slightly improved their houses. At the same time, they gave attention to their children education, purchased better clothes, which, of course, increased their overall status in the rural society. They could also give special offer of eggs as gift to their relatives. Some households were confident that in near future they would be able to pay some social fees for religious institution (e.g., fee for mosque Imam), which would ultimately increase their social status among rural communities.

3.9 Credit worthiness

During the project life, some respondents applied for NGO loans and some of them received loans, whereas they were not considered as creditworthy just a couple of years ago. After AR, NGOs allowed them for livestock or other loans as they had some assets (animal stocks), which were considered as security for repaying their loan. The participating women households showed their solvency to local NGOs for taking loans.

3.10 Small savings

Financial capital increased through savings during the whole project period. Some goat keeping households sold castrated male goats during *Eid-ul-Azha* (one of the greatest Muslim festivals) and received a substantial amount of money. One beneficiary sold a castrated goat at Tk 2000.0 and she spent this money to repair house and to buy a new doe for breeding purposes. Twelve AR households saved money in cash and on an average saving per household was Tk 376.0 during the project year while all households had a stock of chicken and/or duck and/or goat at the end of project year and its value on an average savings was Tk 1250.0 only. The goat keeping households made the highest amount of savings in kind (stock of goat at the end of project life) (Table 12). The savings reduced vulnerability of the AR households. The AR households were quite happy that they had a sustainable financial capital (stock of livestock), which would give further earnings at an increasing rate and it could be a right way to reduce poverty for resource-poor households in rural Bangladesh.

3.11 Increased stock value and flock size

Animal stocks were increased by hatching eggs and/or birth of at least one to two kids at a time in every six months. Increased stocks were cross bred, which generally had the chance of laying more eggs than indigenous breed. In all areas, households increased their animal stock. All goat households increased their herd size of goat while only 3 duck and 2 chicken households increased their stock in all areas (Table 13). Two duck households sold their entire flock/stock and then purchased goats. One household purchased a goat by selling duck eggs and 4 ducks (Table 13). Two households sold their entire stock of goats and each of them bought a heifer for achieving higher income to improve livelihood standard. This result is very much similar to the findings of Todd (1998) study.

Table 12: Number of and Amount of Money Saved by AR Households

Types of savings	Chicken households		Duck households		Goat households		All households	
	No.	Tk/year	No.	Tk/year	No.	Tk/year	No.	Tk/year
Savings in cash	2	355	3	265	7	430	12	376
Savings in kind (end stock of chicken, duck and goat)	8	556	9	377	13	2281	30	1250
Total	8	645	9	465	13	2513	30	1400

Source: Adapted from Sarwer (2011, p. 114).

3.12 Increased level of confidence and gained knowledge on livestock keeping

Beneficiary group membership helped each of the participants to develop their self-confidence. There was a competition within the group members to produce

Table 13 : Stock Status of AR Farmer

Beneficiaries	Study villages	Species at beginning of AR	Species after AR	Changes in stock value at the end
Beneficiary1	Thakurakona	10 Ducks	7 Ducks + 1 chicken	Increased
Beneficiary2	Thakurakona	10 Ducks	6 Ducks + 1 goat	Increased
Beneficiary3	Thakurakona	10 Ducks	2 Goats	Increased
Beneficiary4	Thakurakona	10 Ducks	1 Goats	Increased
Beneficiary5	Charbogra	3 Goats	1 Heifer	Increased
Beneficiary6	Charbogra	3 Goats	1 Heifer	Increased
Beneficiary7	Chariswardia	3 Goats	Goat + Cow	Increased

Source: Adapted from Sarwer (2011, p. 114).

more number of eggs. This means, they worked hard to earn much higher income. They tried to create a social linkage which helped them to increase their production capacity and management efficiency. Rahman (2006) showed in his study that the higher social network increased household capability and reduced household vulnerability. The majority of households intended to continue to keep livestock after the end of the project but they were concerned about how they

would manage disease without the support of the project, more particularly the availability of vaccines.

The AR farmers have gained a substantial knowledge on household livestock keeping since they participated in training program on livestock keeping and management. Previously they had no knowledge about how to control and manage livestock scientifically, particularly during the period of outbreak of diseases. Knowledge regarding livestock feeding also increased. They did not know how to manage worms of the goat. They have also learnt technical knowledge about improved housing for goat, chicken and duck rearing. Even some farmers did not know the location of veterinary hospitals and their activities. Most of the farmers followed indigenous and/or very rudimentary methods of treatment for their animals. After introducing the AR, they have learnt a lot about scientific housing, improved medicare facilities and veterinary services.

3.13 **Increased women mobility**

The selected poor women usually remained confined to their houses before participating in the AR program. This scenario has totally changed in AR households of the study areas. The mobility of the women beneficiaries has increased due to livestock and poultry rearing (Table 14). Livestock and poultry rearing offered the women beneficiaries to spend livestock income independently for their households. The frequent movements of twelve women out of 32, particularly who reared chicken and duck, increased at the local shops either for selling chicken and duck eggs and/or purchasing feeds, medicines, etc. Three women visited 3-5 times a year to pay school fees of their children. The AR households did not go to veterinary hospital previously but due to intervention of AR, 4 women went to veterinary hospital for the treatment of their animals and birds. Six women also went to shops for purchasing animal drugs, which was their new experience in this field. A few women only (2 out of 32) visited relatives' houses because they were now able to bear traveling cost of their visits. Todd (1998) also showed similar findings in her study. Since the women (15 households) contributed to house repairing works by providing money earned from livestock and poultry, their husbands had given importance to their opinions in house repairing activities. It was also essential to collect feed for their animals from outside, which were done by the 20 beneficiaries in the study areas. Two beneficiaries went to tailor shops to make school uniform for their children. The earnings from livestock and poultry keeping, as stated before, ware spent on making school uniform of their children.

4. Livelihood Adaptation

Generally, the poor households tried to adjust their livelihood by their limited household income. The AR households increased their livelihood adaptability by

Table 14: Activities Performed by AR Beneficiaries in the Study Areas

Name of activities	Number of beneficiaries	% of beneficiaries
Visited shops for selling eggs and purchasing feeds	17	77.3
Visited school to pay education fees	3	10.0
Visited veterinary clinics	4	13.3
Visited animal drug shops/dispensaries	6	20.0
Visited relatives houses	2	6.7
Share with husband in decision making processes	15	50.0
Visited neighbor's houses to purchase chicken	2	6.7
Collected animal feed	20	66.7
Visited human doctor's dispensary for treatment	3	10.0
Purchasing school uniform for c hildren	2	6.7

Source: Adapted from Sarwer (2011).

using their increased household income from AR animals. During their shock period such as sickness of family members, the poor had to sell their productive household assets just a few years ago. Some households spent their small savings also. But AR households used livestock income to manage their shocks without selling any household asset. Head of one household seasonally migrated to sell labor and he sent money to his wife to maintain his family but she faced trouble when he could not send any money due to some unavoidable circumstances. But the wife was well capable to manage the family by using her livestock income. Due to cyclone, dwelling houses of 3 AR farmers were fully damaged during the study period and then they repaired their houses successfully by using own income received from goat sales. The participants of AR households were sending children to school as they were capable to pay school fees, uniform, tiffin and education materials. Before rearing project animals, they were not capable to manage education costs. One AR woman also coped uncertain situation when she was separated from her son.

A comparison between "before" and "after" was made for the participants of the project. By selling chicken and duck eggs the AR women commonly purchased daily food items while it was less common before rearing chicken and ducks. At

the same time, their per capita food intake was also increased. During shock period, they managed unusual situation without selling productive assets. Before joining the project, they could not sell eggs commercially but after participating in the project they started rearing cross bred chicken and ducks and selling eggs commercially to local shops and to neighbors. Traditionally, they reared indigenous chicken and ducks and produced less number of eggs, which were mainly used for home consumption. But after rearing cross bred chicken and ducks they had sufficient number of eggs for selling. As a result, consumption of eggs mainly by children was also increased. On the other hand, they were connected with NGOs to get credit as they had stock of livestock as security. The AR women increased their mobility as linkage with local markets, shops, school, veterinary hospitals, drug shops and NGOs. Uses of natural resources such as open water body for duck feeding, grassland and roadside grass for goat keeping increased (Table 15).

Both cash and non-cash incomes were earned from chicken, duck and goat by the AR households. The AR women visited local shops and markets for selling eggs and goat, which increased their social network, and thus the movement of the women increased, which reduced their household vulnerability. They also earned

Table 15: Changes in Major Livelihood Patterns among AR Households

Livelihood activities	Before joining the project	After joining the project for rearing livestock
Food items purchased by women	Less common	Common
Disposing productive assets	Common	Less common
Lower amount of food intake than required	Common	Less common
Egg consumption by children	Rarely	Increased
Egg consumption by adult	Almost nil	Increased
NGO credit support	Absent	Common
Women mobility	Less common	Common
Clothe bought by women	Less common	Common
Rearing improved chicken and duck bred	Absent	Started
Commercial egg selling by chicken and duck households	Absent	Common
Paying school fees	Less common	Common
Repaired houses when required	Absent	Less common
Visited doctors	Almost absent	Sometimes
Visited local shops	Less common	Common
Confidence in earnings from livestock	Less	Fair
Knowledge in livestock raising	less	Fair
Uses of natural resources (open waterbody, grass land, roadside animal feed)	Almost absent	Fair
Competition between individuals within groups in making more income from livestock	Absent	Increased

Source: Adapted from Sarwer (2011, p. 116).

non-cash income as egg consumption, livestock as dowry to daughter and jobs in livestock raising, which improved their nutritional level and also social status. Additionally, they used animal by-products to increase further production of other crops cultivated at homestead areas. The livestock incomes were spent to purchase different items from shops and local markets, which gave them the opportunity to know more number of unknown people, which helped to create a wider network in the society. At the same time it helped to improve human and animal health conditions due to purchase of food items as well as to increase women mobility. Though it was small but a proportion of income spent to purchase a sewing machine to earn further additional income might increase the overall household security. A complete diagram on livelihood adaptation by livestock households is presented in Figure 1.

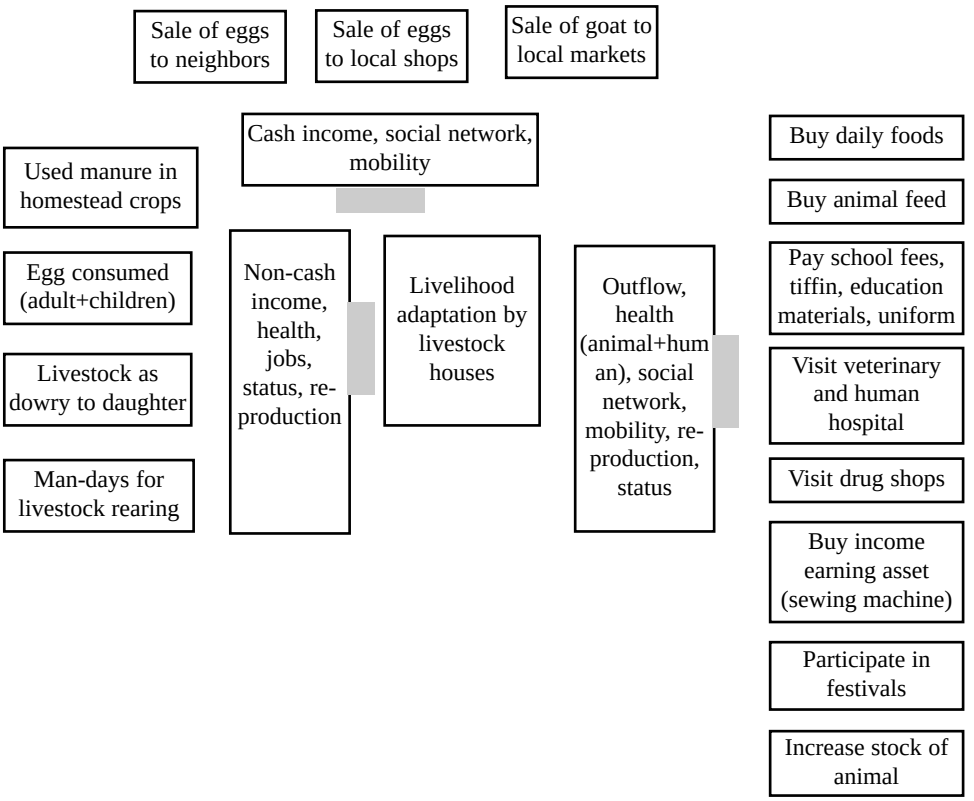

Figure 1: Structure of Livelihood Adaptation Strategies by AR Households through Livestock Rearing

5. Conclusion

By keeping livestock, the beneficiaries improved their livelihoods, increased food security and got self-employment, which improved both their economic condition and social rights. During other external shocks (i.e., flood) when they had no other incomes, the chicken and duck beneficiaries could purchase food by spending egg incomes. Some of the beneficiaries saved money and invested in more chicken and goat to increase herd size. The women also increased their movements in livestock rearing related activities and increased their share in decision making process of households. There was no occupational trade-off due to chicken, duck and goat rearing; rather the women utilized their idle time properly in livestock farming. The beneficiaries thought that their income increased due to project intervention and it helped to increase their social status. So, the AR households increased their access to food, education, clothing, health care, shelter, natural land, natural water body, social participation, local markets and local livestock related health care centers, which reduced their household vulnerability as a whole. Finally, it could be concluded that the resource-poor people, more particularly the rural women, can be far better off by rearing some chicken, duck and goats. The concerned government and NGO officials should pay an immediate attention and appropriate steps could be taken to expand this technology to the rural poor of Bangladesh.

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