Villagers' Perception of Arsenic Issues on Their Livelihood Assets

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Abstract

The study was carried out to determine the extent of villagers' perception of arsenic issues on their livelihood assets and to explore the relationships between the selected characteristics of the villagers and their perception. Azampur village of Shimulia union in Jhikargachha Upazila under Jessore district was the locale of the research. Arsenocosis affected and un-affected villagers were considered as the population of the study. Total 35 persons were arsenic affected in the village and they were all under sample along with other 35 unaffected villagers who were selected randomly. So the sample size became 70. A pre-tested interview schedule was used to collect data from the respondents in August 2007. To measure the extent of villagers' perception of arsenic issues, five-point Likert type scale was used. Correlation Coefficient (r) was computed to explore the relationship of the selected characteristics of villagers with their extent of perception of arsenic issues. About three fourths (74 percent) of the respondents had moderately favorable perception and the rest 26 percent had unfavorable perception of arsenic issues on their livelihood assets. Out of five capitals of livelihood assets, the highest Perception Index (55 percent) was associated with social capital and the lowest was for financial capital (24 percent). Three characteristics of the villagers *viz.* level of education, cosmopoliteness and exposure to arsenic information showed significant positive relationships with their perception of arsenic issues on their livelihood assets. 'Lack of training on arsenic issues', 'lack of concept about effect of arsenic problem' and 'lack of initiatives from donor agencies' were the major blocks to participate in arsenic mitigation initiatives as identified by the villagers.

Keywords*: Perception, Arsenic, Livelihoods, Bangladesh*

Introduction

Bangladesh is one of the densely populated countries in the world. It has an area of 1,47,570 square kilometers with population of about 140.6 million with an annual growth rate of about 1.48 percent (BBS, 2007). The country has different kinds of water resources which includes both surface and ground water e.g. rivers, canals, lakes, ponds, shallow tube-wells (STWs), deep tube-wells (DTWs), hand tube-wells (HTWs) etc. Since the identification of the arsenic problem in Bangladesh, much work has been done to address the problem and its solution. This includes research, identification of scale of

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the problem, awareness raising and attempts to provide alternatives to mitigate this problem. Arsenic problem in Bangladesh was first identified in 1993 when arsenic induced pigmentation keratosis was detected in some areas of southwestern parts of Bangladesh (Khan, 1993). The source and the underline process involved in the contamination of groundwater of some regions of Bangladesh are not clear.

It is possible that the contamination of soil sediment and water might have occurred both from natural and anthropogenic sources. Pyrites are reported to be found in the soil layers of alluvial plains. The skin becomes dark and spotted due to the deposition of a black pigment. Eventually the spots become thickened and hard, the worst prognosis being a cancerous gangrene (Zaman, 2001). Arsenicosis also affects other parts of the body, including the central nervous system, the heart and blood vessels, and causes a range of internal cancers, particularly affecting the bladder and lung (Gou and Lu, 1994). Other than these, some other socio-cultural concerns are also reported due to arsenic contamination. So, what is the real situation in the field of total outcome of arsenic contamination on human bodies and their livelihoods needs to be explored. This study is thus, considered empirically to investigate the effect of arsenic on the livelihood assets of people at village level. In view of the considerations stated above the following specific objectives were studied:

a) To determine the villagers' perception of arsenic issues on their livelihood assets. The assets were: (i) social capital, (ii) human capital, (iii) natural capital, (iv) financial capital and (v) physical capital

b) To explore the relationship between the selected characteristics of the villagers and their perception of arsenic issues on livelihood assets. The selected characteristics were: age, level of education, family size, farm size, annual income, family cooperation, cosmopoliteness and exposure to arsenic information.

c) To identify the problems confronted by the villagers to participate in arsenic mitigation initiatives.

Methodology

The locale of the study was Azampur village of Shimulia union in Jhikargachha Upazila under Jessore district. Arsenocosis affected and un-affected people of Azampur were considered as the population of the study. Total 35 villagers were arsenic affected and were considered as sample along with other 35 un-affected villagers selected randomly from other 1318 villagers. So the total sample stood to 70. An interview schedule was developed to collect necessary data from the villagers to determine their extent of perception of arsenic issues on their livelihood assets. Data were collected during 04 to 28 August, 2007. In this study 8 characteristics were selected as independent variables viz. age, level of education, family size, farm size, annual household income, family cooperation, cosmopoliteness and exposure to arsenic information. Villagers' perception of arsenic issues on their livelihood assets (i.e. the dependent variable) was measured through the following livelihood assets: Social capital, Human capital, Natural capital, Financial capital and Physical capital.

All these capitals were comprised of some specific and relevant issues. For the measurement of all the aspects, five-point Likert-type scale was used. Each statement was comprised of possible reply of "strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' with corresponding scores of 4, 3, 2, 1 and 0. Perception Index (PI) has been used to determine the extent of perception of arsenic issues on their livelihood assets. It was defined as the ratio of 'actual perception' to 'possible perception' in any issue expressed as percentage.

The Perception Index (PI) was mathematically expressed as follows:

$$PI = \frac{1}{5} \times \left(\frac{s_a}{s_p} + \frac{n_a}{n_p} + \frac{h_a}{h_p} + \frac{f_a}{f_p} + \frac{p_a}{p_p} \right) \times 100$$

Where,

PI = Perception Index
s_a = Actual Score of social capital
s_p = Possible Score of social capital
n_a = Actual Score of natural capital
n_p = Possible Score of natural capital
h_a = Actual Score of human capital
h_p = Possible Score of human capital
f_a = Actual Score of financial capital
f_p = Possible Score of financial capital
p_a = Actual Score of physical capital
p_p = Possible Score of physical capital

In the present study, extent of perception of the villagers' on arsenic issues has been computed according to the formula of Perception Index (PI). Thus, Perception Index (PI) could vary from 0 to 100 percent, '0' indicating 'unfavorable' Perception and '100' indicating 'favorable' perception in different livelihood assets. By adding the assigned scores of five aspects of the respondents together, the perception score of a farmer was obtained. This perception score has been used for further statistical analysis with the values of independent variables. Correlation coefficient (r) was computed to find out the relationships between dependent and independent variables.

Constraints faced by the respondents in participating arsenic mitigation committee were measured through preparation of Scored Causal Diagrams (SCDs). Problems in participating arsenic mitigation initiatives were discussed with the respondents, assuming the 'end problem' being 'low participation in arsenic mitigation initiatives'. Firstly the problems mentioned by the respondents were listed, secondly diagrams were drawn by them on a large paper on the ground to show causal relationships between the problems, and finally scoring of selected problems was performed again by them. In this way SCDs was prepared by the group of respondents.

Findings and Discussion

Perception of arsenic issues on livelihoods
The computed PI of the respondents ranged from 18.29 to 61.71 with an average of 39.91. Based on their PI, the respondents were classified into three categories. Data furnished in Table 1 show that the highest proportion (74.3) of the respondents had moderately favorable perception. Data also indicate that about one-fourth of the total respondents (25.7) had unfavorable perception and none had favorable perception of arsenic issues. Maddox (1995) and Hassanullah (1995) found similar findings in their respective studies. It was probably due to adequate exposure to arsenic issues, level of education and existing knowledge of the

respondents. Some NGOs, especially Development & Rehabilitation Organisation (DRO), have been working to create awareness among the peoples regarding arsenic problems and their effects on human health and environment.

Table 1. Overall perception levels of the villagers

Respondents			Mean	SD
Perception category	No.	%		
Unfavorable (≤ 33)	18	25.7		
Moderately favorable (34-67)	52	74.3	39.91	10.02
Favorable (68-100)	0	0		

Among the villagers, they have very much favorable perception (54.89 percent) in social capital. The extent of perception of other capitals was 45.14 percent in human capital, 42.21 percent in physical capital and 33.39 percent in natural capital. The lowest perception (24.29 percent) of the respondents was in financial capital due to being their poorness.

Table 2. Livelihood asset-wise perception levels of the respondents

Aspects	Perception Index (PI)	Rank order
Social capital	54.89	1
Human capital	45.14	2
Physical capital	42.21	3
Natural capital	33.39	4
Financial capital	24.29	5

Selected characteristics of the villagers

The salient findings of selected characteristics have been presented in Table 3. In the present study, age of the respondents ranged from 9-80 years with an average of 41.90 years and standard deviation 12.83. Data show that more than half portion (57.1 percent) of the respondents were middle-aged while young respondents were the lowest (12.9 percent) and old constituted 30.0 percent. The level of education of the respondents ranged from 0 to 13 years, the average being 3.99 with a standard deviation of 3.66. The highest level of education of the respondents was primary education (32.8 percent) and the secondary level of education of respondents were 30.0 percent, 14.3 percent can sign name only, 20.0 percent of the respondents were illiterate and 2.7 percent higher had level of education. It is expected that education is one of the important factors in determining villagers' perception. It helps farmers to broaden their out look and expands their horizon of knowledge.

Table 3. Salient findings on the selected characteristics of the farmers

Characteristics (Measuring unit)	Range		Respondents			Mean	SD
	Possible	Observed	Category	Nr.	%		
Age (years)	-	9 -80	Young (<30)	9	12.9	41.90	12.83
			Medium (31-45)	40	57.1		
			Old (>45)	21	30.0		
Education (years of schooling)	-	0 -13	Illiterate (0)	14	20.0	3.99	3.66
			Can Sign only (0.5)	10	14.3		
			Primary (1-5)	23	32.8		
			Secondary (6-10)	21	30.0		
			Higher (11-16)	2	2.7		
Family size (number)	-	1 -14	Small (1-4)	34	48.6	5.00	2.15
			Medium (5-6)	25	35.7		
			Large (>6)	11	15.7		
Farm Size (hector)	-	0.028 -1.636	Small (0.021-1.00)	57	81.4	0.56	.446
			Medium (1.10-3.00)	13	18.6		
			Large (>3.00)	0	0.0		
Annual income (in '000' Tk.)	-	18 -160	Low (<50)	30	42.9	66.79	33.83
			Medium (51-100)	25	35.7		
			High (>100)	15	21.4		
Family cooperation (score)	0 -14	1 -14	Low (0-5)	2	2.9	12.14	2.51
			Medium (6-10)	14	20.0		
			High (11-14)	84	77.1		
Cosmopoliteness (score)	0 –18	0 -13	Not at all (0)	2	2.9	6.31	3.27
			Low (1-6)	29	41.4		
			Medium (7-12)	38	54.3		
			High (13-18)	1	1.4		
Exposure to Arsenic problem (score)	0 –33	2 -20	Low (0-5)	20	28.6	8.30	3.98
			Medium (6-10)	34	48.5		
			High (11-33)	16	22.9		

About half (48.6 percent) of the respondents had small sized family, 35.7 percent had medium family and 15.7 percent had large family. Data indicate that highest proportion (81.6 percent) of the respondents had small farm size and 18.4 percent respondents were found to have a medium farm size. However, there were no respondents in large categories of farmers in the study area. Most of the villagers were poor and day laborer. Data show that the highest proportion (42.9 percent) of the respondents had low family income followed by the respondents of medium family income (35.7 percent) and only 21.4 percent respondents had high family income. Income of an individual

allows him/her to invest more in farming operations taking risks involved in adoption of new alternative technology. While, most of the farmers had high (77.1 percent) family cooperation followed by the respondents 20.0 percent medium family cooperation and only 2.9 percent had low family cooperation. The family cooperation was high because the patients were their family members. All time they work together, take meal with, play with each other.

More than half of the farmers (54.3 percent) were in medium cosmopoliteness category followed by 41.4 and 2.9 percent were in low and not at all cosmopoliteness categories

respectively. And only 1.4 percent of the farmers were in high cosmopolite category. Data furnished in the Table 3 indicate that slightly less than half of the farmers (48.5 percent) had medium exposure to arsenic problem followed by 28.6 percent had low and 22.9 percent had high exposure.

Relationship between selected character-ristics of the respondents and their perception

It is an established fact that perception is related to many of things of an individual. Individuals' physical characteristics, their needs and values, knowledge, feeling or past experience influence formation of perception. In this section, relationships between selected characteristics of the respondents and their perception of arsenic issues on their livelihood assets have been discussed.

Table 4. Correlation between independent and dependent variables

Independent Variables	'r' value
Age	0.130
Level of education	0.312**
Family size	0.093
Farm size	0.194
Annual household income	0.106
Family cooperation	- 0.230
Cosmopoliteness	0.385**
Exposure to arsenic information	0.265*

* Significant at 5% level of probability
**Significant at 1% level of probability

Age and perception Based on the computed 'r' value (0.130) the relationship between age and extent of perception of arsenic issues on their livelihood assets was non-significant (Table 4). Hence, the concerned null hypothesis could not be rejected. Kabir (2001) and Islam (2001) found similar findings in their respective studies. Thus it could be said that age of the respondents did not play any important role on their extent of perception of arsenic issues on their livelihood assets.

Level of education and perception Based on the computed 'r' value (0.312) the relationship between level of education of the villagers and their extent of perception of arsenic issues on their livelihood assets was positively significant. Hence, the concerned null hypothesis was rejected. That means increased level of education of the villagers led to better perception of arsenic issues on their livelihood assets. Islam (2000) and Sarker (1999) found similar findings in their respective studies. Thus, level of education of the villagers played significant role on their extent of perception of arsenic issues on their livelihood assets. Actually, education enhances an individual to be more conscious and rationale and thus his/her perception become higher than a non-educated person.

Family size and perception The relationship between family size and extent of perception of arsenic issues on their livelihood assets was non-significant (r=0.093). Hence, the concerned null hypothesis could not be rejected. Islam (2001), Hossin (2000) and Majydyan (1996) observed the similar findings in their respective studies. Thus, it could be said that family size of the respondents was not important to measure their extent of perception of arsenic issues on their livelihood assets.

Farm size and perception The computed 'r' (0.194) value shows that the relationship between farm size and extent of perception of arsenic issues on their livelihood assets was non-significant. Hence, the concerned null hypothesis could not be rejected. Sarker (1999) observed the similar findings in his respective study. Thus, it could be said that farm size of the respondents did not considerably affect their extent of perception of arsenic issues on their livelihood assets.

Annual household income and perception
The relationship between annual household income and extent of perception of arsenic issues on their livelihood assets was non-significant (r=0.106). Hence, the concerned null hypothesis could not be rejected. Kabir (2001) and Fardous (2002) also reported similar relationships in their respective studies.

Family cooperation and perception The relationship between family cooperation and extent of perception of arsenic issues on their livelihood assets was non-significant (r = 0.230) but followed a negative trend. Hence, the concerned null hypothesis could not be rejected. So, the extent of perception of the villagers on arsenic issues was not greatly dependent on their family cooperation.

Cosmopoliteness and perception Based on the computed 'r' value (0.385) the relationship between cosmopoliteness of the villagers and their extent of perception of arsenic issues on their livelihood assets was positively significant. Hence, the concerned null hypothesis was rejected. That means increased cosmopoliteness of the villagers led to better perception of arsenic issues on their livelihood assets. Sarker (1999) found similar findings in his respective study. Thus in the present study, cosmopoliteness of the villagers was highly relevant to determine their extent of perception of arsenic issues on their livelihood assets.

Exposure to arsenic information and perception The correlation between exposure to arsenic problem of the villagers and their extent of perception of arsenic issues on their livelihood assets was positively significant (r=0.265). Hence, the concerned null hypothesis was rejected. That means increased exposure to arsenic problem of the villagers led to better perception of arsenic

issues on their livelihood assets. Sharmin (2005), Sayeed (2003), Kabir (2002) and Fardous (2002) also found similar findings in their respective studies.

Villagers' problem confrontation in participating arsenic mitigation initiatives
The problems identified by the group has been listed here with their relative importance indicated by the original score numbers as shown inside the parentheses (Figure 1). From Figure 1 intermediary problems and root causes to the end problem 'low participation in arsenic mitigation initiatives' have been extracted as follows:

Intermediary problems:
  (i)   Lack of knowledge and skill (45)
  (ii) Lack of consciousness (10)
  (iii) Lack of family education (10)
  (iv) Deprived from medicine (5)
  (v)   Deprived from water (5)
  (vi) Deprived from the opportunity (10)
  (vii) Lack of time (10)
 (viii) Poverty(10)
  (ix) Family problem (15)
  (x)   Political problem (15)
  (xi) Conflict with land (5)
  (xii) Personal attack (10)
 (xiii) Shyness (5)
 (xiv) Negligence (5)

Root causes:
  (xv) Lack of training (45)
 (xvi) Lack of concept about effect of arsenic problem (10)
 (xvii) Lack of initiatives from donor agencies (10)
(xviii) Lack of real experience (5)
 (xix) Self-pride (5)
  (xx) Religious ethics (5)
 (xxi) Lack of financial support (5)
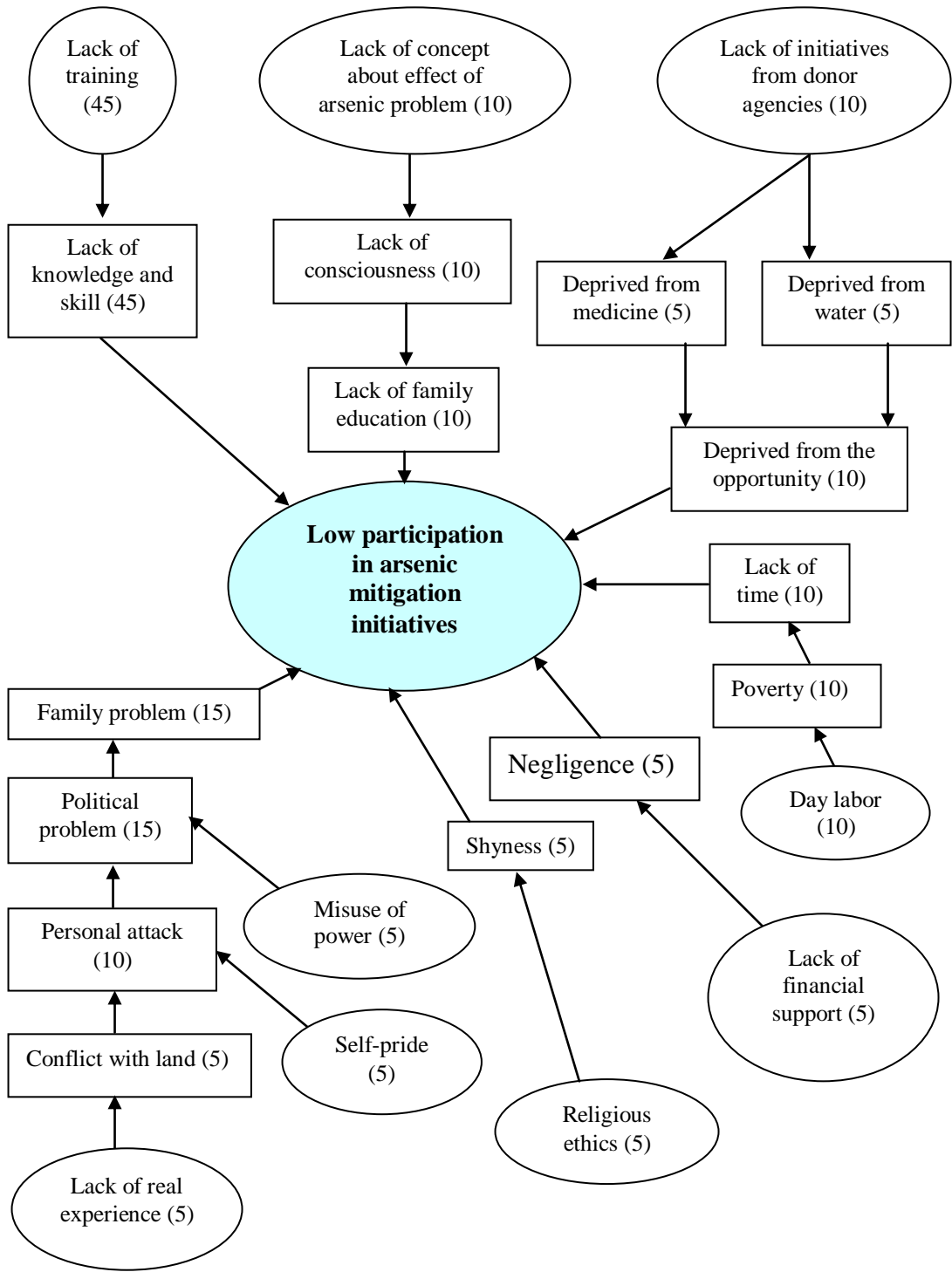 (xxii) Day labor (10)
(xxiii) Misuse of power (5)

Figure 1. SCDs showing issues of low participation in arsenic mitigation initiatives

Conclusions

Most of the villagers had moderately favorable perception of arsenic problem in their livelihood assets. The average Perception Index (PI) of the villagers was low (40). Among five aspects of livelihood assets, financial capital was responsible for the less favorable perception. Thus, there is ample scope to form favorable perception of villagers towards arsenic problems on their livelihoods. This can be achieved by active campaign and spot training of Ministry of Environment of the government.

Most of the villagers were illiterate or educated up to primary level. Further, education had significant and positive relationship with their extent of perception of arsenic issues. Hence, increased educational level might be helpful for the formation of better perception of arsenic issues on livelihood assets. Moreover, significant positive correlation of villagers' cosmopolitness and exposure to arsenic information with their perception also endorse assumption. Yet it might be suggested that there is further scope to clarify their perception of arsenic issues by increasing their further exposure to arsenic information.

The majority of the problems were created for the lack of training about arsenic issues and lack of initiatives by the donor agencies. As those problems more or less fell under jurisdiction of different GOs and NGOs, these organizations can help the villagers participate functionally in arsenic mitigation initiatives.

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