

Article

Improving training on cleaner production through Borich needs assessment model in SAF leather industry, Nowapara, Jessore, Bangladesh

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Abstract: The present study has been undertaken to assess the training needs of employer on cleaner production in SAF leather industry at Jashore district in Bangladesh. Using Borich Need Assessment Model for training needs. A total 60 employers were surveyed including 20 employers from each group and data were collected on socioeconomic condition of responders, management activities in leather processing and environment pollution related issues through the questionnaire. The importance level, competence needs were analyzed and ranked using weighted discrepancy scores (WDS). The study revealed that the highest WDS score (15.38) was found for Beam house worker that indicated the training is strongly needed for them on identification of harmful chemicals and environmental pollution. Crust and fishing unit worker needed high training (WDS score= 15.10) on understanding the types and quantities wastewater discharged from industry during leather processing and its management. The WDS score 14.78 was estimated for administrative employers where they needed high training on controlling odor problem from the industry. Although they have an average knowledge about the environmental pollution, they did not have qualified level of capabilities on understanding how to use some environmental tools e.g. social impact assessment and environmental auditing. Therefore, majority of the respondents preferred training for reduction of environmental pollution.

Keywords: environmental pollution; training needs; Borich need assessment model, cleaner production

1. Introduction

Leather Company is one of the three major tannery players in the country and more than 60% of their products are exported. Leather production uses raw material in the form of cow and buffalo hides and goat and sheep skins and a number of imported chemicals (Richards, 2010). Bangladesh is a developing country with a population of about 152.5 million in a total area of 147,570 sq.km making it one of the most heavily populated countries of the world. The overall economy of Bangladesh has registered a steady improvement with more than 6% average growth during the last five years (BBS, 2013). The industrial sector has been an important contributor to the country's GDP, its share standing at 28.6% in 2011. Bangladesh has along established tanning industry which produces around 2-3% of the world's leather from a ready supply of raw materials (Aquim *et al.*, 2010). The country is therefore an established and attractive location to source and out of source the manufacture of finished leather products. The leather industry is ideally suited to Bangladesh with its abundance of labor and natural resources at internationally competitive rates (Money, 2003). Protection of the environment is a major concern all over the world has concern for the protection of the environment through the Ministry of Environmental Affairs (MEA). Industrial pollution control is one of the concerns because the industrial sector is considered a main environmental polluter. Tanning industry is considered one of the heavy polluting industries in Palestine (Bird, 1996). Treatment of animal hides and skins comprises the preparation and processing of this

raw material, using large amounts of chemicals and enormous volumes of water and generating significant pollution load (Beard, 1996). The tanneries discharge into the same manhole, from where the wastewater goes directly into the municipal sewer system which discharges into the river without any type of treatment. As a result, the tanneries in Bangladesh are responsible for tremendous environmental impact. Tanning and its associated operations can be a source of considerable environmental impact. Air and water pollution, widespread odors, poisoning from toxic gas, and unsafe disposal of waste are among the problems that have been experienced to a greater or lesser extent in the tanning industry (HSMA, 2005). However, pollution from tanneries, as from any major industry, has a negative long-term impact on the growth potential of a country, irrespective of the immediate economic benefits of production. Cleaner production meets the dual objective of reducing environmental degradation resulting from discharge of pollutants into the environment and of reducing production costs (Meric *et al.*, 2005). Low cost modifications to current tanning practices can potentially reduce the amount of sulfides and other materials discharged with the wastewater (Hawken, 1993). These changes can dramatically reduce production costs. The underlying research aims at investigating the feasibility of applying cleaner production principles as a tool for improving the environmental and economic quality in the leather tanning industry (Barbazette, 2006). The goal of the study is to improve the environmental quality and, therefore, the economical quality of the leather tanning industry (BTA, 2010). The objective is to reduce the environmental impact and the production cost of the unhearing, liming process by recycling the process effluent. The objectives of the study is to familiarize the concept of Cleaner Production in SAF leather industry. Another objectives is to evaluate the impact of training on cleaner production and to identify employer perception regarding reduction the environmental pollution.

2. Materials and Methods

2.1 Study area

SAF leather Industry of Abhaynagar upazila at Jashore district was selected as the study area (Figure 1) as it was extremely affected the environment. Abhaynagar upazila is the area 247.19sq km, located in between 23 degree 07 minute and 23 degree 15 minute north latitude and in between 89 degree 18 minute and 89 degree 34 minute east longitudes.

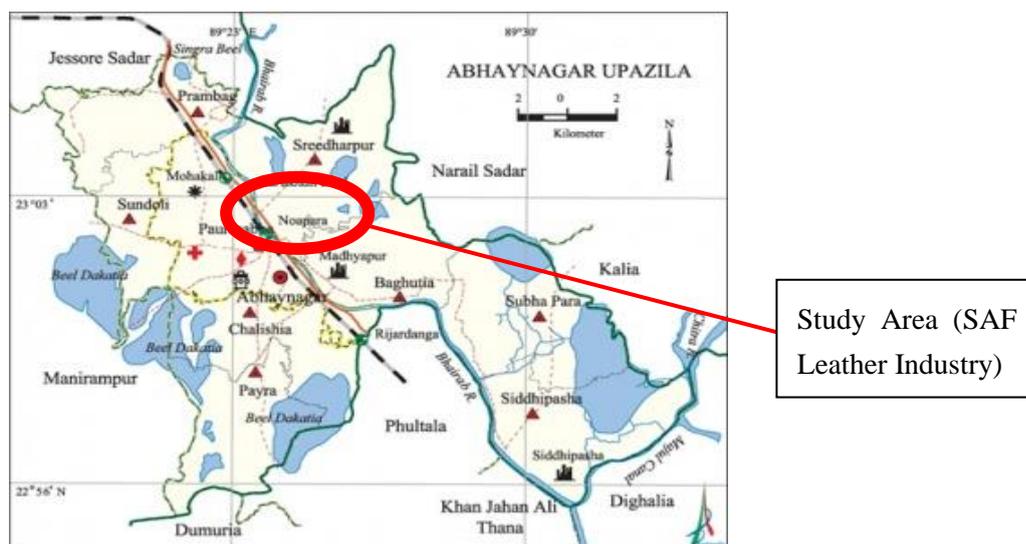


Figure 1. Red circle showing study area.

2.2 Data collection

This study used a combination of qualitative and quantitative methods for data collection through questionnaire survey. Several versions of draft questionnaire was prepared and modified. Related journal papers were reviewed and training manuals followed for preparing the draft questionnaire. According to the findings from the manuals, related journal papers and experts opinion the questionnaire was divided into three sections. The first section contained the socio economic characteristics of the respondents; the second section contained the three broad management activities in leather processing and third section environmental pollution related issues. To assess both the competence and importance level of respondents a scale of 1 to 5 were used for the second section of the questionnaire, where 1= very low, 2= low, 3= intermediate, 4= high and 5= very high.

However, to assess both the competence and importance level regarding climate change related issues a scale of 1 to 3 were used. Where 1=low, 2= intermediate and 3=high. The information obtained from the training manuals and related environmental pollution management was not adequate to develop a scale of 1 to 5, hence such scale was used. The questionnaire was pre-tested in the field before final data collection and was modified accordingly.

Three distinct groups of employer were selected from three group as (Beam house worker, Crust and retaining, finishing unit worker and Administrative employer) for questionnaire survey. A total of 60 employers were surveyed including 20 employer from each group. Administrative employer who has participated was considered as group A, Crust and finishing unit worker was considered as group B and Beam house worker who have participated considered group C.

2.3 Data analysis

Training needs with regard to need assessment of agricultural teachers, extension agents, farmers, etc. was evaluated using the “Borich Needs Assessment Model” (Borich, 1980) as described by Ghasemi et al (2009). This is one of the most widely used models in agricultural education and agricultural extension. Weighted discrepancy score (WDS) was calculated using the following formula for evaluating and ranking farmers’ training needs (Borich, 1979).

$$WDS = DS * MIL$$

$$WDS = (IL - CL) * MIL$$

Where WDS= weighted discrepancy score, DS= discrepancy score, IL=employer-determined level of importance of each competency, CL= employer-determined level of knowledge of each competency, MIL= mean importance rating for each competency.

3. Results and Discussion

3.1 Socio- economic profile of the respondents

This study has received socio-economic condition of each 3 group. In this regard, gender (both male and female), age, educational qualification, training are represent the socio-demographic information profile. The socioeconomic characteristics of the three group are summarized below in Table 1.

3.2 Age of the respondent

Among 60 employer 60% were between 30-40 year, 25% were between 25-30 year, and 15% were above 40 year. The mean age of group A is 29.4 year, group B has mean age 33.5 year and group C has mean age 31.85.

Table 1. Socio economic characteristics of the respondent.

Variables	Group A (%)	Group B (%)	Group C (%)	Variables	Group A (%)	Group B (%)	Group C (%)
<u>Age</u>				<u>Education</u>			
30-40Year	40	60	30	Only sign	60	0	10
25-30year	50	30	10	Under SSC	20	10	20
Above 40	10	10	60	SSC	10	10	20
				HSC	10	30	40
				Graduated	0	50	10

3.3 Educational status of the respondents

Based on the survey data, Respondents of the groups had educational qualification as low in the Beam house worker. Among three Groups there have higher educational qualification in administration sector as Group B had the maximum highest education as MSc. Among the respondents 62% had Bachelor degree and 38% had Master’s degree education. From the survey we found in group A most of them can only sign and in Group C as crust and finishing unit most of them are HSC and SSC. In group A there have 60% worker can only sign and 35% under SSC and 5% HSC. In Group C 50% HSC and 30%SSC, 20% completed graduation.

3.4 Variation in competence (knowledge) level and training needs related

3.4.1 Perception of competence and importance level and training needs of environmental pollution

The perception of importance and competence level for the three group in environmental pollution. All the groups rated environmental pollution as highly important. The mean competence level group A 2.85 and group

B has mean competence level 2.85 and group C has competence level 2.09. Group C rated environmental pollution and its management as highly important. Group B also indicated high importance level environmental pollution while group C high importance level in environmental pollution respectively. These differences in the perception of importance may be due to their differences in understanding and importance level. The group A have intermediate competence level and importance level. In group C there have high WDS and there need high training on environmental pollution and group A there have intermediate WDS score as 9.07 and Group B have low WDS score as 8.99. In group C WDS score 15.38 is very high and its training needs is high (Table 2).

Table 2. Perception of competence level in environmental pollution.

Topic	Mean score					
	Importance level		Competence level		DS	WDS
Environmental pollution	Mean	SD	Mean	SD		
Group - A	4	1.16	2	0.70	1.80	9.07
Group - B	4.76	1.06	2.85	0.91	1.90	8.99
Group - C	4.76	1.06	2.09	0.94	2.66	15.38

3.4.2 Perception of competence and importance level and training needs of sources of environmental pollution in SAF leather industry

The difference of mean score among three group about sources of environmental pollution in SAF leather industry. In group A there have Importance mean score is 3.80 and competence mean score is 1.27 there WDS is 10.72. In Group B here WDS score is 12.32 and group C there have mean importance score is 3.80 and mean competence score is 1.47 and WDS is 9.24. In this table there have WDS score of group B is high and according to Borich need assessment model the group B required high need assessment training about sources of environmental pollution from their industry and its control strategies (Table 3).

Table 3. Perception of competence level in sources of environmental pollution in their leather industry.

Topic	Mean score					
	Importance level		Competence level		DS	WDS
Sources of environmental pollution	Mean	SD	Mean	SD	DS	WDS
Group - A	3.80	1.24	1.27	0.74	2.33	10.72
Group - B	4.76	1.21	2.04	0.80	2.71	12.32
Group - C	3.80	1.16	1.47	0.74	2.33	9.24

3.4.3 Perception of competence and importance level and training needs of Chemical used in SAF leather Industry

The perception of importance and competence level for the three group in environmental pollution. All the groups rated environmental pollution as highly important. The mean score of competence level group A 1.42 and group B has mean score of competence level 2.09 and group C has mean score of competence level is 1.42. The mean importance score and WDS score of group A is 3.85 and 11.24. The mean importance level and WDS of group B 4.75 and 12.24. The mean importance level and WDS of group C is 3.80 and 9.50. Group B rated chemical used and its management as highly important. Group A also indicated intermediate importance level of chemical used while group C low importance level in chemical used respectively. These differences in the perception of importance may be due to their differences in understanding and importance level. The group A has intermediate competence level and importance level. In group C there have low importance level and WDS and group B have high importance level and WDS is also high so this respondents need high training on chemical that used in their industry during leather processing (Table 4).

Table 4. Perception of competence level and training needs on chemical used.

Topic	Mean score					
	Importance level		Competence level		DS	WDS
Chemical used in this Industry	Mean	SD	Mean	SD		
Group - A	3.85	1.31	1.42	0.59	2.42	11.24
Group - B	4.75	1.09	2.09	1.04	2.06	12.10
Group - C	3.80	0.64	1.42	0.59	2.38	9.50

3.4.4 Perception of Competence and importance level and training needs of which chemical are most harmful that used in SAF leather Industry

The perception of importance and competence level for the three group in environmental pollution. All the groups rated environmental pollution as highly important. The mean score of competence level group A 2.00 and group B has mean score of competence level 2.85 and group C has mean score of competence level is 2.05. The mean importance score and WDS score of group A is 4 and 9.07. The mean importance level and WDS of group B 4.76 and 8.99. The mean importance level and WDS of group C is 4.76 and 15.38. Group C rated which chemical are mostly harmful that used and its management as highly important. Group B indicated intermediate importance level of chemical used while group A low importance level in chemical used respectively. These differences in the perception of importance may be due to their differences in understanding and importance level. The group B has intermediate competence level and importance level. In group A there have low importance level and WDS and group C have high importance level and WDS is also high so these respondents need high training on chemical that used in their industry during leather processing (Table 5).

Table 5. Perception of competence level and training on most harmful chemical that used in their industry.

Topic	Mean score					
	Importance level		Competence level		DS	WDS
	Mean	SD	Mean	SD		
Group - A	4	1.16	2	0.70	1.80	9.07
Group - B	4.76	1.06	2.85	0.91	1.90	8.99
Group - C	4.76	1.06	2.09	0.94	2.66	15.38

3.4.5 Competence and importance level and training needs of type of waste from SAF leather Industry

The perception of importance and competence level for the three group in environmental pollution. All the groups rated environmental pollution as highly important. The mean score of competence level group A 1.42 and group B has mean score of competence level 1.42 and group C has mean score of competence level is 2.04. The mean importance score and WDS score of group A is 3.80 and 10.97. The mean importance level and WDS of group B 4.76 and 15.10. The mean importance level and WDS of group C is 4 and 7. Group B rated type of waste and its management as highly important. Group A indicated intermediate importance level of waste while group C low importance level in type of waste respectively. These differences in the perception of importance may be due to their differences in understanding and importance level. The group A have intermediate competence level and importance level. In group C there have low importance level and WDS and group B have high importance level and WDS is also high so this respondents need high training on type of waste from industry during leather processing (Table 6).

Table 6. Perception of competence and importance level importance and training in type of waste.

Topics	Mean score					
	Importance level		Competence level		DS	WDS
	Mean	SD	Mean	SD		
Group - A	3.80	1.12	1.42	0.59	2.38	10.97
Group - B	4.76	1.09	1.42	0.59	1.33	15.10
Group - C	4	1.76	2.04	0.80	1.76	7.00

3.4.6 Competence and importance level and training needs of type of waste from SAF leather Industry

The perception of importance and competence level for the three group in environmental pollution. All the groups rated environmental pollution as highly important. The mean score of competence level group A 1.10 and group B has mean score of competence level 1.18 and group C has mean score of competence level is 2.85. The mean importance score and WDS score of group A is 4.66 and 14.78. The mean importance level and WDS of group B 4.0 and 10.54. The mean importance level and WDS of group C is 4.76 and 8.99. Group A rated high in odor problem and its management as highly important. Group B indicated intermediate importance level of waste while group C low importance level in type of waste respectively. These differences in the perception of importance may be due to their differences in understanding and importance level. The group B have intermediate competence level and importance level. In group C there have low importance level and WDS and

group A have high importance level and WDS is also high so this respondents need high training on odor problem from industry (Table 7).

Table 7. Perception of competence and importance level and training on odor problem.

Topic	Mean score					
	Importance level		Competence level		DS	WDS
	Mean	SD	Mean	SD		
Odor related Which waste smell the worst						
Group - A	4.66	0.90	1.10	0.34	2.48	14.78
Group - B	4.0	1.30	1.18	0.40	1.98	10.54
Group - C	4.76	1.06	2.85	0.91	1.90	8.99

3.4.7 Competence and importance level and training needs of solid waste disposal space in SAF leather industry

The perception of importance and competence level for the three group in environmental pollution. All the groups rated environmental pollution as highly important. The mean score of competence level group A 1.40 and group B has mean score of competence level 1.56 and group C has mean score of competence level is 1.19. The mean importance score and WDS score of group A is 4.36 and 12.24. The mean importance level and WDS of group B 4.82 and 14.40. The mean importance level and WDS of group C is 3.22 and 5.09. Group B rated high in solid waste disposal problem and its management as highly important. Group A indicated intermediate importance level of waste while group C low importance level in solid waste disposal and its management respectively. These differences in the perception of importance may be due to their differences in understanding and importance level. The group A have intermediate competence level and importance level. In group C there have low importance level and WDS and group B have high importance level and WDS is also high so these respondents need high training on solid waste disposal and its management from industry (Table 8).

Table 8. Perception of competence and importance level and training on solid waste disposal space.

Topic	Mean score					
	Importance level		Competence level		DS	WDS
	Mean	SD	Mean	SD		
Solid waste related						
Where are solid waste disposed of						
Group - A	4.36	0.96	1.40	0.52	1.98	12.24
Group - B	4.82	0.80	1.56	0.54	2.30	14.40
Group - C	3.22	1.21	1.19	1.14	1.7	5.09

3.4.8 Perception of competence level and importance and training on excess waste in SAF industry

The perception of importance and competence level for the three group in environmental pollution. All the groups rated environmental pollution as highly important. The mean score of competence level group A 1.42 and group B has mean score of competence level 1.42 and group C has mean score of competence level is 1.40. The mean importance score and WDS score of group A is 3.80 and 10.97. The mean importance level and WDS of group B 4.76 and 15.10. The mean importance level and WDS of group C is 3.37 and 6.27. Group B rated high in excess waste problem and its management as highly important. Group A indicated intermediate importance level of waste while group C low importance level in excess waste disposal and its management respectively. These differences in the perception of importance may be due to their differences in understanding and importance level. The group A have intermediate competence level and importance level. In group C there have low importance level and WDS and group B have high importance level and WDS is also high so this respondents need high training on excess waste and its management from industry (Table 9).

Table 9. Perception of competence level and importance and training on excess waste in SAF industry.

Topic	Mean score					
	Importance level		Competence level		DS	WDS
	Mean	SD	Mean	SD		
Excess waste related						
How much and what kind of products are lost in production stage						
Group - A	3.80	1.12	1.42	0.59	2.38	10.97
Group - B	4.76	1.09	1.42	0.80	3.33	15.10
Group - C	3.37	1.33	1.40	0.53	1.96	6.27

3.4.9 Perception of competence and importance level and training on workers' health hazard in SAF industry

The perception of importance and competence level for the three group in environmental pollution. All the groups rated environmental pollution as highly important. The mean score of competence level group A 2.04 and group B has mean score of competence level 2.85 and group C has mean score of competence level is 2.04. The mean importance score and WDS score of group A is 4.76 and 14.25. The mean importance level and WDS of group B 4.76 and 10. The mean importance level and WDS of group C is 4.76 and 14.25. Group A and C rated high in workers' health hazard as highly important while group B low importance level in workers' health hazard respectively. These differences in the perception of importance may be due to their differences in understanding and importance level competence level and importance level. In group B there have low importance level and WDS and group A and C have high importance level and WDS is also high so this respondents need high training on workers' health hazard (Table 10).

Table 10. Perception of competence and importance level and training on workers' health hazard in SAF industry.

Topics	Mean score					
	Importance level		Competence level		DS	WDS
	Mean	SD	Mean	SD		
Group - A	4.76	1.09	2.04	0.80	2.71	14.25
Group - B	4.76	1.09	2.85	0.96	1.90	10
Group - C	4.76	1.09	2.04	0.80	2.71	14.25

3.4.10 Perception of competence and importance level and training on excess waste in SAF industry

The perception of importance and competence level for the three group in environmental pollution. All the groups rated environmental pollution as highly important. The mean score of competence level group A 2.04 and group B has mean score of competence level 2.85 and group C has mean score of competence level is 2.04. The mean importance score and WDS score of group A is 4.76 and 14.25. The mean importance level and WDS of group B 4.76 and 10. The mean importance level and WDS of group C is 4.76 and 14.25. Group A and C rated high in workers' health hazard as highly important while group B low importance level in workers' health hazard respectively. These differences in the perception of importance may be due to their differences in understanding and importance level competence level and importance level. In group B there have low importance level and WDS and group A and C have high importance level and WDS is also high so this respondents need high training on workers' health hazard (Table 11).

Table 11. Perception of competence and importance level and training on excess waste in SAF industry.

Topics	Mean score					
	Importance level		Competence level		DS	WDS
	Mean	SD	Mean	SD		
Group - A	4.76	1.09	2.04	0.80	2.71	14.25
Group - B	4.76	1.09	2.85	0.96	1.90	10
Group - C	4.76	1.09	2.04	0.80	2.71	14.25

4. Conclusions

This study assessed the impact of training on leather industry employer their perception of adverse impact of environmental pollution. Training has positive impact in terms of both production and competence level. A little diffusion of the training knowledge was observed from group A to group B. Consequently, farmers showed higher needs for future training for selection of quality and environmental pollution control. The training needs of extension personal evolve with time, training needs assessment should be carried out on a continuous basis, and vital areas in which the extension personnel need training should be incorporated into training plans. Hence, the study indicates a need to focus on the planning of training courses in areas such as Based on the multiple linear regression analysis and Borich Needs Assessment Model, special skills is the most important independent variable (highest effect) that affects training needs, while age is the least important variable. The study also confirms that the employer has a significant positive relationship with training. The underlying research aims at investigating the feasibility of applying cleaner production principles as a tool for improving the environmental

and economic quality in the leather tanning industry. The goal of the study is to improve the environmental quality and, therefore, the economical quality of the leather tanning industry.

Conflict of interest

None to declare.

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