Socio-demographic Factors Influencing Bangladeshi Professionals' Towards Biotechnological Products

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ABSTRACT

It is widely accepted that biotechnology is a globally significant and growing research field.This study aimed to assess socio-demographic profile of professionals working in public and private organization in Bangladesh toward biotechnological products. The data were collected by simple random sampling model, while face-to-face interviews were held by the researchers and quantitative collected data were analyzed and formulated as qualitative results. The results of the survey showed that, the participants have an optimistic opinion, which reflected a belief that the widespread consumption of biotechnological products led to the prosperity of human health and environment, andprofitable in socio-economic terms. Findings reveal that most of the participants were young aged, Master degree holders, had short length of service, moderately used information source mostly internet and had moderate knowledge about biotech products in Bangladesh. The top most biotechnological products consumed were soybean oil, antibiotics, skin care cream, stress resistant rice and vaccine in Bangladesh. This study includes of limited number of professionals from public and private sectors only involved in biotechnological products in Bangladesh.The findings and suggestions for this study might be useful for food producers, industry and food policy makers involved in biotechnological production and, able to monitor the capacities and the compliance of national policies in biotechnology in Bangladesh. This research for the first time assessed the attitudes and consumption levels of biotechnological products by the professionals from both public and private sectors in Bangladesh.

***Keywords**: Biotechnology; Socio-demographic; Professionals'; Policy; Profile;*

Biotechnology is "the application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services" (*OECD 2011*). It has attracted much attention as a significant and growing interdisciplinary field in the Life Sciences research around the world (*OECD 2011*). The biodiversity has become increasingly important for the research and development of biotechnological products (*Shaw 1993*), and is an element with a significant potential for developing countries (*Zilberman et al. 2004*). Bangladesh is a biodiverse country, where its vast existing life forms depend on limited plant surface. Bangladesh is basically an agricultural country and a reasonable size of industry upon which 80 percent of people depends. Fertile alluvial soil of the Ganges-Meghna-Brahmaputra (GMB) delta, coupled with high rainfall (average 100 cm) and easy cultivation, has made this small riverine country coveting for many outside settlers from the immemorial time which is the root cause of thick population (*World Bank 2013*).

It was found that the use of modern biotechnology, although started long back during late 1970, in Bangladesh under the Department of Botany, Dhaka University with tissue culture of jute.There are many research organizations were developed and worked on biotechnology and its products successfully in Bangladesh from 1970 to 1998. Finally,in 1999, the

National Institute of Biotechnology was established as the center of excellence for biotechnological education (*Chaturvedi and Rao 2004*).Biotechnology has been changing the world through advancement in agriculture, health, environment, medicine, pharmaceuticals, nutraceuticals, beautyceuticals etc. In contrast, while other countries are making impressive progress in biotechnology, Bangladesh has also making a successive improvement in this field now a day.Presently, good number of Govt. organizations such as National Institute of Biotechnology (NIB), Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI), Bangladesh Institute of Nuclear Agriculture (BINA), Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Bangladesh Council of Scientific and Industrial Research (BCSIR), Bangladesh Atomic Energy Commission (BAEC), Bangladesh Livestock Research Institute (BLRI), Bangladesh Fisheries Research Institute (BFRI) etc. and some other private organizations such as ACI, Incepta pharmaceuticals Ltd., Lal Teer, Square Agri Tech, Aman Agro Industries, Astron Herbal Toiletries, GETCO etc. and NGOs (DEBTECH and PROSHIKA) are also working on biotechnology (*National Biotechnology Policy 2011*).

Scientific revolution in molecular biology over the last two decades has led to swift progress in accepting the genetic basis of living organism and the ability to develop processes and products useful to food security, nutrition and human health (*ADB 2001; Persley2000*). Since the first production of biotechnological products, it has been seen that, these products have attracted the increasing attention of the world and are offered for consumption on a wide scale (*Oguz2009*). There is many fascinating research directed by using biotechnology not only in agriculture but also in animals and livestock, pharmaceuticals, environmental, medical, industrial and fisheries sectors now a day in Bangladesh.While other countries are making impressive progress in biotechnology, Bangladesh has also making a successive improvement in this field now a day. Many products such as Bt-brinjal, Genetically Modified Organism (GMO) soybean, high quality banana, tissue culture of orchid, rhizobium biofertilizers, increased silk production, biogas production from animal excreta, DNA Finger printing, insulin production and export, veterinary biologics (11 types), vaccines for foot and mouth disease, genetically improved farmed tilapia (GIFT), industrial and therapeutic uses of protein keratinase enzyme, biopiracy etc. are developed in Bangladesh. Moreover, *in-vitro* production of disease free seedlings revolutionized the increase in potato production in Bangladesh (*Ilangantileke et al.2000*). The use of probiotics (living microorganism) is emerging as a powerful biotechnological product that have high potentiality for the improvement of health of animal, fishes, human and even in plants (*Islam and Hossain 2012; Maheswari 2012*), eco-friendly in shrimp farming in Bangladesh (*Rahman et al.2009*) and an effective tool for bioremediation in shrimp farming in India (*Jha, 2011*).

Currently, essential vaccines such as shigella, rotavirus, pneumonia, cholera, tetanus and small pox are developing through International Centre for Diarrhoeal Disease Research (ICDDRB) and Institute of Public Health (IPH). Some work has been initiated on agro bacterium mediated genetic transformation of rice, jute, oil seed, potato, chickpea, papaya for insect, fungus and virus resistance, genetic transformation of pulses for fungus resistance, salinity and drought tolerance and nutritional enrichment. However, Bt-cotton was trailed in different locations in Bangladesh, which is on the pipeline now. The fullest potential of biotechnology would only be realized, if consumers and the food industry consider it safe and beneficial (*Hoban 2004b*). In order to feed a vast population of over 160 million in Bangladesh, it is indispensable to develop stress tolerant and saline tolerant crop varieties to combat climate change induced disasters like flood, drought and intrusion of salinity. The socio-demographic profiles of the professional participants will helpful to measure the present status of biotechnological products in various stages, which is beneficial to the businessman, policymaker etc. who have desire to invest in this sector. Therefore, it is crucial to create a demand driven market of biotechnological products in Bangladesh as food security in the days to come.

The objective of this study was to assess the socio-demographic profiles of the professionals working at both public and private sectors in Bangladesh toward biotechnological products.

METHODOLOGY

The small scale research was conducted as a

descriptive survey study on the basis of a simple random sampling model, where interviews were held with 90 participants, who represent the professionals of Bangladesh. The research Scientists, university teacher and private sector personnel of biotechnology, breeding and biological science disciplines were included in the population as they are well known about biotechnological products and they might have biasness toward biotechnology. At the end, six research Scientists, university teacher and private sector personnel from each of those 15 organizations were the sample frame of the study selected randomly from 200 populations. Professionals to be interviewed from each institute were randomly selected and interviews were conducted with these personnel by conforming to biasness of answers. The distribution of the demographic variables of the participants is shown in Table 1. There is a balanced distribution among the research Scientist, university teacher and private sector personnel participants comprise the whole population.

The researchers themselves collected data using a semi-structured interview schedule with face-to-face interaction with the participants. All possible precautions were taken to avert biasness and to maintain reliability of responses. Nevertheless, the biasness effect of the interviewer was deducted as far as possible. The entire process of data collection was completed during April to June 2014.Collected data were coded for processing and analysis. The SPSS computer software program 16.0 version was used to perform the data analysis. Qualitative data were converted into quantitative ones by means of suitable scoring, whenever needed. For describing the particular dependent and independent variables, the participants were classified into several categories in respect of each variable. Frequency counts and percentages as well as means, standard deviations, rank order, cross tabulation were used for descriptive data.

RESULTS AND DISCUSSION

Demographic Characteristics of the Participants: Behavior of an individual is determined to a large extent by his personal characteristics. Five characteristics of the participants were identified for investigation in the present study. These characteristics are discussed below:

Age : The age of an individual is an important social factor in understanding many aspects and also one of the most important factors pertaining to one's personality makes up. The age of the participants ranged from 25 to 64 years and the average age was 37.23 years. Data included in Table 1 reveal that, more than two-fifths portion of the participants (59%) were young as compared to 27 per cent of middle aged and 14 per cent of the participants were old age categories.

Table 1. Distribution of the participants based on their age

Categories	No.	%
Young	**53**	**59**
Middle aged	24	27
Old	13	14
Total	90	100

Therefore, a big majority of the participants (86%) belonged to the young to middle age categories. The elders are important in many ways; they have long experience in many spheres of life. The young and middle-aged people are more interested in participating of a learning context compared to the old aged people. The reasoning behind the less participation of the older segment may be that their life was so burdened and they do not have interest to take any types of venturesome activities.

Education: Empirically education was defined as the number of successful years spent by the participants in receiving formal education. Education of the participants ranged from 16 to 21, the mean being 19.39 with standard deviation of 1.58. It indicates that the participantshave the educational level from Graduate to PhD. Findings presented in the Table 2 reveal that one half of the participants were Master degree holders followed by 48 percent PhD degree holders while only 2 per cent were Graduate.

Table 2. Distribution of the participants based on their education

Categories	No.	%
Graduate	2	2
Masters	45	50
PhD	43	48
Total	90	100

Therefore, a vast majority of the participants (98%) has Master to PhD level of education. The findings imply that individuals having higher education were engaged in university teaching, research activities and industry groups in Bangladesh.

Length of service : Length of service of the respondent was determined by the number of years from their date of joining in the service to the time of interview. The length of service of the participants ranged from 1 year to 40 years, the mean being 8.04 with standard deviation of 8.54. Table 3 depicts that, nearly three-quarters of the participants (74%) has short length of service compared to 16 percent being medium and 10 percent under long length of service.

Table 3. **Distribution of the participants based on their length of service**

Categories	No.	%
Low	67	74
Medium	14	16
High	9	10
Total	90	100

Findings reveal that, a great majority of the participants (90%) has medium to long length of service. Therefore, it can be furnished that it is imperative to prioritize on the young job holders to expand the development of biotech products in Bangladesh.

Use of information sources : Media has a persuasive power and influence in Bangladesh and is perceived to have an effective role, among others, to stimulate economic development and shape the country's social, economic, and political life. Print media has seen a phenomenal growth with about 2,100 registered publications of newspapers and periodicals. Television is the most popular media and has the potential to reach the illiterate section of the public which accounts for 50 percent of the population. Bangladesh Television (BTV), the state-owned national TV channel, has a potential coverage of about 93 percent of the total population. It aims to motivate people to take parts in development activities. Bangladesh Betar is the only radio network in the country and is government-owned. It has a crucial role in "fulfilling some role in changing people's attitude and behavioral patterns and creating mass awareness about the issues that affect them" (*Khan, 2008*).

Media plays a vital role in spreading biotech messages to the public. Stakeholders are sensitized through print and electronic media towards acceptance of biotech crops. Most of them are aware of the technology through the print media. Media monitoring of 24 newspapers was done in a 10-year period, 1999-2009. A total of 878 articles on biotechnology were published with an annual average of 88 articles. Articles during the first half of the decade averaged from 49 to 65 per year. There were more articles published from 2005 to 2009 about 109 articles per year (Nasiruddin and Azad, 2010). The scores on the use of information sources of the participants ranged from zero (0) to 36 against actual scores. The mean and standard deviation were 16.99 and 6.93, respectively.

Table 4. Distribution of the participants based on their information source

Categories	No.	%
Low User	22	25
Medium User	55	61
High User	13	14
Total	90	100

Results presented in Table 4 demonstrate that more than three-fifths of the participants (61%) were the medium user of information sources, while a quarter was low user, and 14 percent were high user of information sources, respectively. Findings reveal that as many as 86 percent of the participants were low to medium user of information sources.The major sources of information on biotechnology were internet (14%), colleagues (13%), newspapers/publication (13%), seminar/workshop (12%), group meeting (11%), biotech experts (10%), radio/television (10%). Friends and relatives (9%) and training (8%) were relatively petty information source regarding biotechnology, which indicate that in Bangladesh friends and relatives and training are yet to play less important role in advocacy regarding biotechnology.

Overall information source used by different categories participants: Information source is one of the independent variables for these categories. There have some discrepancies in using the information source to gather information from biotech products by different categories of the participants.

Table 5. Distribution of the different categories participants based on their information source about biotech products

Categories	%
University Teacher	27
Research Scientist	35
Private Sector Personnel	38

Data shown in Table 5 reveal that private sector personnel (38%) are higher information user than

Research Scientists (35%) and university teachers' (27%) use of information source. It implies that private sector personnel were high level user of information source to collect information about biotech products compared to university teachers. It also indicates that private sector personnel are commercially involved and highly communicate with information sources to know latest news about biotech products due to their job purposes in Bangladesh.

Knowledge on biotech products : Knowledge as defined in this study included 'those behavior and test situations which emphasized the remembering either by recognition or recall of ideas, material or phenomenon' (Bloom, 1956). Scores of knowledge on biotech products of the participants ranged from 18 to 111 against the possible range of zero (0) to 120. The mean and standard deviation were 51.08 and 17.83, respectively. Data presented in Figure 6 reveal that more than three-fifths of the participants (63%) had medium knowledge on biotech products, while 31 and 6 percent had low and high knowledge on biotech products, respectively. Therefore, a vast portion of the participants (94%) has low to medium knowledge on biotech products.

Table 6. Distribution of the participants based on their level of knowledge on biotech products

Categories	No.	%
Low	28	31
Medium	57	63
High	5	6
Total	90	100

The knowledge of the participants in biotech products is composed of three categories viz. awareness knowledge, principle knowledge and application/how to knowledge (*Rogers 1983*). These three categories of knowledge are described below:

Table 7. Distribution of the participants based on their level of awareness knowledge on biotech products

Categories	No.	%
Low	8	9
Medium	57	63
High	25	28
Total	90	100

Awareness knowledge : Awareness knowledge score of the participants on biotech products ranged from 03 to 40 against the possible range of zero (0) to 40. The mean and standard deviation were 21.01 and 6.68, respectively.

Findings shown in Table 7 indicate that more than one half of the participants (63%) had medium awareness knowledge on biotech products followed by high and low awareness knowledge on biotech products. Thus, as many as 91 percent of the participants belonged to medium to highly aware about biotech products which is most important for dissemination and improvement of biotech products.

Principle knowledge : Principle knowledge score of the participants on biotech products ranged from 06 to 38 against the possible range of zero (0) to 40. The mean and standard deviation were 16.28 and 6.91, respectively. Data presented in Table 8 indicate that more than one half of the participants (53%) had medium principle knowledge on biotech products, while 35 and 12 percent had low and high principle knowledge on biotech products, respectively.

Table 8. Distribution of the participants based on their level of principle knowledge on biotech products

Categories	No.	%
Low	31	35
Medium	48	53
High	11	12
Total	90	100

So, a greater portion of the participants (88%) has low to medium principle knowledge on biotech products.

Application knowledge : Application knowledge score of the participants on biotech products ranged from 06 to 38 against the possible range of zero (0) to 40. The mean and standard deviation were 13.79 and 6.20, respectively.

Table 9. Distribution of the participants based on their level of application knowledge on biotech products

Categories	No.	%
Low	47	52
Medium	38	42
High	5	6
Total	90	100

Data presented in Table 9 reveal that more than one half portion of the participants (52%) had low application knowledge on biotech products, while 42 and 6 per cent had medium and high application knowledge on biotech products, respectively. The findings reveal

that vast portion of the participants (94%) has low to medium application knowledge on biotech products.

The knowledge of research scientists, university teachers and private sector personnel was measured category-wise on biotech products and shown below:

Research Scientist knowledge : Research Scientist knowledge is determined in terms of awareness knowledge, principle knowledge and application knowledge in this study.

Table 10. Distribution of the research scientist participants based on their knowledge on biotech products

Knowledge	Score (%)
Awareness knowledge	41
Principle knowledge	32
Application knowledge	27

It implies that Research Scientists' awareness knowledge (41%) is higher followed by principle (32%) and application knowledge (27%). It reveals that Research Scientists are highly aware of biotech products compared to having basic information on biotech products while their application of gathered information is not up to expected level.

University teacher knowledge : University teacher knowledge is determined in terms of awareness knowledge, principle knowledge and application knowledge in this study.

Table 11. Distribution of the university teacher participants based on their knowledge on biotech products

Knowledge	Score (%)
Awareness knowledge	40
Principle knowledge	31
Application knowledge	29

Data shown in Table 11 indicates that university teacher has more awareness knowledge (40%) on biotech products compared to application knowledge (29%). It reveals that university teacher are highly aware of biotech products but their application knowledge in pragmatic life is low.

Table 12. Distribution of the private sector personnel participants based on their knowledge on biotech products

Knowledge	Score (%)
Awareness knowledge	23
Principle knowledge	33
Application knowledge	44

Private sector personnel knowledge : Private sector personnel knowledge is determined in terms of awareness knowledge, principle knowledge and application knowledge in this study.

It reveals that private sector personnel application knowledge (44%) is higher followed by principle knowledge (33%) and awareness knowledge (23%). It implies that private sector personnel have highly applied their gathered information about biotech products while having lack of preliminary information about biotech products.

Overall knowledge of different categories of the participants: Knowledge is one of the important variables for in this study. There have some differences among their knowledge level on biotech products.

Table 13. Distribution of the participants based on their overall knowledge on biotechnological products

Overall Knowledge	Score (%)
Scientist knowledge	36
Educationist knowledge	33
Industry personnel knowledge	31

It implies that Research Scientist knowledge (36%) is higher than the university teacher (33%) and private sector personnel knowledge (31%). It reveals that Research Scientists are more knowledgeable having highly involved in the research program compared to university teachers and private sector personnel in biotech products development in Bangladesh.

Major biotechnological products in Bangladesh : Among all of theusedbiotech products, the top most product is soybean oil is highly consumed by the respondents which is 16 per cent of total biotech products consumption followed by antibiotics (13%), skin care cream (9%), resistant rice (8%), vaccine (5%).

CONCLUSION

This study for the first time assessed the socio-demographic profiles of Bangladeshi professionals toward biotechnological products. It is apparent that, majority of the Bangladeshi professionals has an optimistic outlook about biotechnology and its products. Most of the professional group of the study were young aged, had Master degree holders and short to medium length of service. Four out of five respondents (81%) had favorable to high favorable attitude towards biotech products. This implies that biotech products have

potentials to be introduced in Bangladesh after necessary investigation and verification trail. Major portion of the participants had favorable attitudes toward the biotechnological products. It implies that biotechnological products have high potentials to be introduced in Bangladesh. It assumes that attitudes toward biotechnological products strongly influenced by age, education, length of service, information source and knowledge about biotechnology. It is apparent that, the hectarage of biotechnological crops are accentuating not only globally but also in Bangladesh at present. Different types of biotechnological products are introduced or to be introduced for development of a prominent market in Bangladesh to be a food and nutrition secured nation. A further study is needed with inclusion of a large population for different stakeholders for precise understanding in existing situation and prospects for biotechnological products in Bangladesh.

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