International Journal of Science and Healthcare Research
[Indexed, Peer-Reviewed Journal]
Vol. 10; Issue: 4; Oct.-Dec. 2025
Website: ijshr.com
Original Research Article *ISSN: 2455-7587*

Health Hazards of Tobacco Farmers in Bangladesh: A Study in Cox's Bazar District

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DOI: https://doi.org/10.52403/ijshr.20250406

ABSTRACT

This study investigates the occupational health hazards experienced by tobacco farmers in Cox's Bazar, Bangladesh with particular emphasis on the prevalence and characteristics of Green Tobacco Sickness (GTS) and related health conditions. Utilizing a mixed-methods design, data were collected from 210 farmers through structured questionnaires, in-depth interviews, and focus group discussions. Results revealed that a substantial proportion of farmers suffers such as vertigo, vomiting tendency, fever, and palpitation which generally align with nicotine exposure via dermal absorption and inhalation. The use of personal protective equipment (PPE) was found to significantly decrease both the frequency of health complications and the financial burden of treatment. Nevertheless, barriers including limited awareness, economic challenges, and discomfort in hot and humid conditions impede consistent PPE use. Despite the documented health hazards, all participants identified tobacco farming as a financially advantageous livelihood, highlighting the complex trade-off between economic necessity and occupational health risks. Based on these findings, the study advocates for comprehensive interventions such as mandatory PPE provision accompanied by practical training, enhanced health education, routine medical screenings, and initiatives to promote alternative less hazardous crops. Achieving sustainable rural development in tobacco-growing communities requires a balanced approach that integrates economic incentives with effective health protections.

Keywords: *Green Tobacco Sickness, Occupational Health, Tobacco Farming, Personal Protective Equipment*

1. INTRODUCTION

The occupational health risks associated with tobacco cultivation, most notably Green Tobacco Sickness (GTS) are emerging as a pressing public health concern on a global scale. GTS is a nicotine-induced illness that predominantly affects individuals engaged in the planting, handling, and harvesting of tobacco. Although tobacco farming continues to be promoted as a source of economic livelihood in many developing countries, it often comes at the expense of workers' health and well-being. Increasingly, public health professionals, researchers, and advocates are drawing attention to the human costs embedded in the tobacco supply chain.

Tobacco is cultivated in more than 124 countries worldwide, encompassing an estimated 3.2 million hectares of arable land. The top three producers China, Brazil, and India collectively account for over 55% of the global tobacco output. According to

the Institute for Health Metrics and Evaluation (IHME) tobacco-related diseases are responsible for more than 7 million deaths annually [1] globally. Bangladesh, which ranks 14th in the world in terms of land used for tobacco farming and 12th in total leaf production, contributes approximately 1.3% of global output [2]. While the sector provides economic returns for many rural households, the broader implications for occupational and public health are increasingly difficult to ignore. Green Tobacco Sickness is primarily caused by dermal absorption of nicotine, especially when workers come into contact with wet tobacco leaves during early morning harvests. The condition presents with a range of acute symptoms, including nausea, vomiting, dizziness, headaches, and generalized muscle weakness [3]. In agricultural settings, such illnesses are often exacerbated by multiple exposures chemical, biological, and physical that interact to compound long-term health risks [4]. During the peak harvesting season, reports of abdominal cramps, vomiting, fluctuations in blood pressure, and neuromuscular symptoms are common among tobacco workers [5]. Tobacco leaves excrete Nicotine and it is a water and lipid soluble alkaloid found in water [6], and harvesters who not using any protective methods collecting tobacco leaves absorb nicotine through the skin. Nicotine dissolved early In the morning in dew water affects those who work with the tobacco field, specifically harvesting tobacco leaves [7-8], This nicotine penetrating and even spreads the brain also [9]. Certain agricultural tasks, such as topping and cutting of mature plants, are associated with particularly high exposure levels [10]. Globally, the reported prevalence of GTS varies widely, ranging from 8.2% to 47%, depending on environmental conditions, harvesting practices, and levels of mechanization [11]. Empirical documentation exists from a range of countries, including Brazil, South Korea, and Thailand, affirming that the problem transcends regional boundaries and demands a coordinated public health response [12-13].

Mental health challenges among tobacco farmers are an emerging but under-addressed aspect of occupational health. Research indicates that approximately 18% of tobacco farmers exhibit symptoms of mild depression, reflecting the psychological strain associated with this form of agricultural labor [14]. Moreover, the routine use of pesticides and chemical fertilizers without adequate protective equipment contributes to respiratory difficulties among farmers, particularly during application periods [15]. These physical stressors are compounded by poor nutritional status, which not only increases susceptibility to illness but also reduces overall physical work capacity [4]. Several risk factors are known to exacerbate the incidence of Green Tobacco Sickness, including younger age, female gender, non-smoking status, handling wet leaves, and prolonged physical exertion during harvest [16]. In particular, extended exposure to wet clothing and nicotine-laden dew significantly increases the likelihood of dermal nicotine absorption, a primary mechanism underlying GTS [11]. Beyond GTS, studies have documented a broader spectrum of health issues among tobacco farmers, including musculoskeletal disorders, mental health problems, and sensory impairments, as observed in research conducted in China province [17]. In the context of Bangladesh, however, there remains a notable gap in comprehensive research addressing the full health implications of tobacco cultivation. While Hasan et al. [18], explored health risks associated with tobacco curing in districts such as Kushtia, Chuadanga, and Jhenaidah, and Ali et al. [19], compared health outcomes between paddy and tobacco farmers in Rangpur. The region of Cox's Bazar remains under studied in this regard. This lack of localized, in-depth investigation limits our understanding of the full extent of

occupational health hazards in one of the country's key tobacco-producing areas.

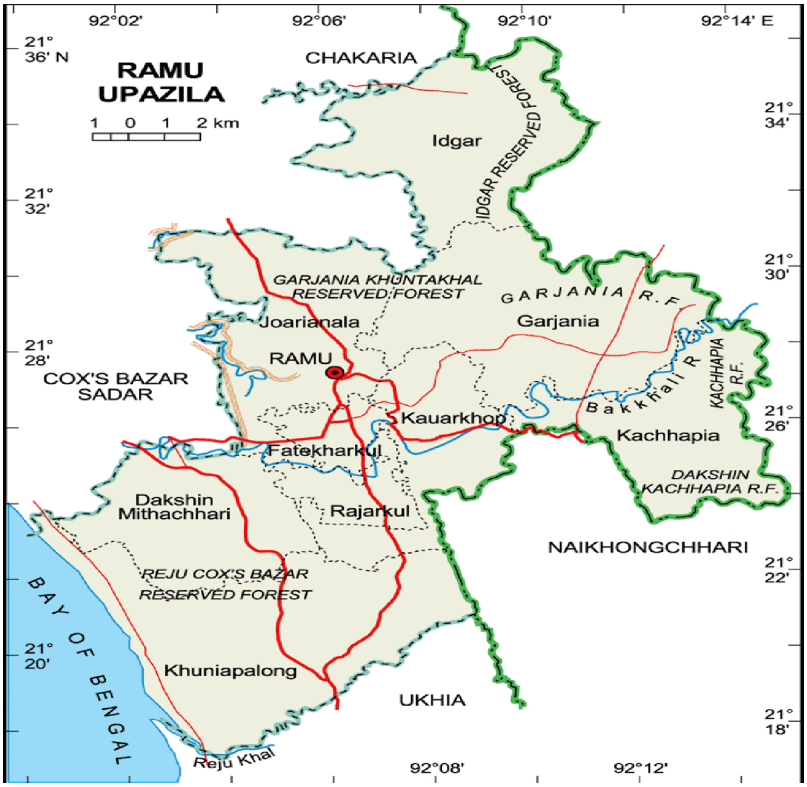
2. OBJECTIVES OF THE STUDY

This study aims to investigate the health hazards associated with tobacco farming in Cox's Bazar, with particular focus on identifying the prevalence, types, and underlying causes of health issues experienced by tobacco farmers. Given the occupational nature of these health risks, the study also seeks to examine the level of awareness among farmers and the impact of workplace safety measures or lack thereof on their overall well-being and treatment burden. The specific objectives are as follows:

a) To identify the common health problems experienced by tobacco farmers.
b) To examine how occupational safety practices influence the occurrence of health problems and the associated treatment costs.
c) To provide practical recommendations aimed at mitigating health risks among tobacco farmers.

3. METHODOLOGY

The study was conducted in Cox's Bazar, a district in southern Bangladesh comprising eight sub-districts (upazilas), with Ramu emerging as a key center for tobacco cultivation over the past decade. Ramu upazila has an estimated population of 431,456, and tobacco farming is widespread throughout the area. The region's primary sources of income include agriculture (47.01%), non-agricultural labor (12.52%), commerce (13.06%), and transport (2.99%), among other sectors. While 33.41% of residents own agricultural land, the majority (66.59%) are landless [20]. Many of these landless individuals engage in tobacco farming by leasing land, often attracted by the relatively higher financial returns.



Source: The Bangladesh Network

A mixed-methods approach was employed to collect and analyze data. A total of 210 respondents were randomly selected from four unions (Idgar, Garjania, Kauarkhop, Kachhapia) within Ramu Upazila. Quantitative data were gathered using

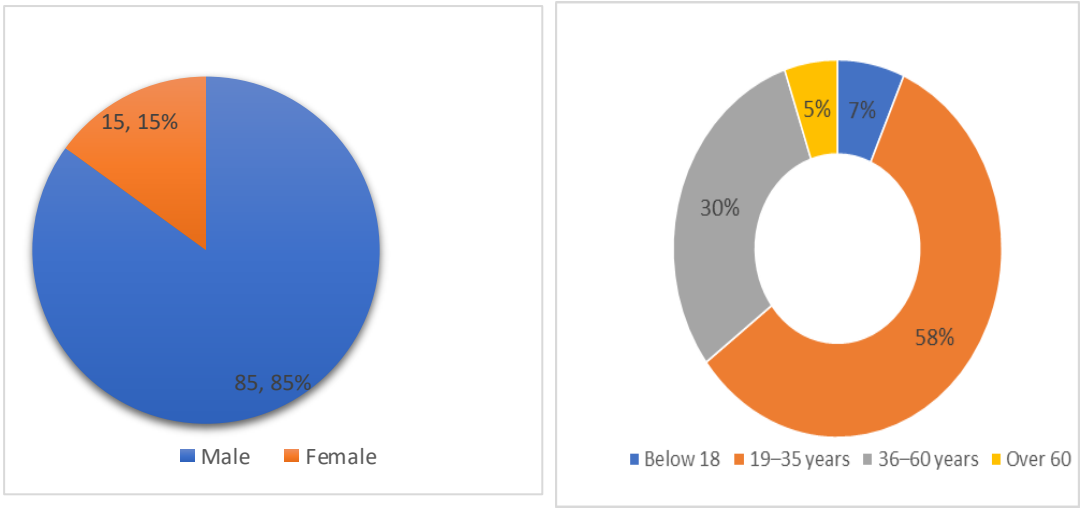
structured questionnaires designed to capture demographic profiles, farming practices, and health issues disaggregated by age and gender. Qualitative data were collected through focus group discussions (FGDs) and direct observations, enabling a more nuanced understanding of farmer experiences. Prior to participation, all respondents were informed of the study's objectives and provided their informed consent. Each interview session lasted approximately 30 to 40 minutes, and data collection was conducted between December 2024 and February 2025. FGDs were held in each of the four unions, involving 10–12 participants per session, and were guided by a thematic checklist. In addition, relevant government documents and national tobacco control policies were reviewed to provide contextual grounding. Data were analyzed using SPSS. All necessary test to check the data quality done (version 30.0).. Descriptive statistics including frequencies and percentages—were used to present the quantitative data, supported by tables and charts. To explore relationships among variables, linear regression analysis was conducted to identify significant predictors of Green Tobacco Sickness (GTS), with statistical significance determined at $p < 0.05$. Variance Inflation Factor (VIF) engage to check multi collinearity.

4. RESULT

4.1 Socioeconomic Profile of Respondents

Of the 210 respondents, 85% were male and 15% female. Most participants were aged between 19 and 35 years old. The primary occupation reported was day labor (49.5%), followed by agriculture (37.1%), Student (6.66%) Homemaker and others (3.33%) with involved in tobacco farming too. The average monthly household income was 19,250 BDT, with the most common income range between 11,000–15,000 BDT (34.2%). While 43% of respondents have owned land, 57% cultivated leased land, and among them, only 25% used both owned and leased land.

Figure 1: Gender and Age Distribution (percentage)



Variable	Frequency	Percentage
Primary Occupation		
Day labor	104	49.5%
Agriculture	78	37.1%
Student	14	6.66%
Homemaker	7	3.33%
Others	7	3.33%
Monthly Household Income (BDT)		
Below 10,000	36	17.1%
11,000–15,000	72	34.2%

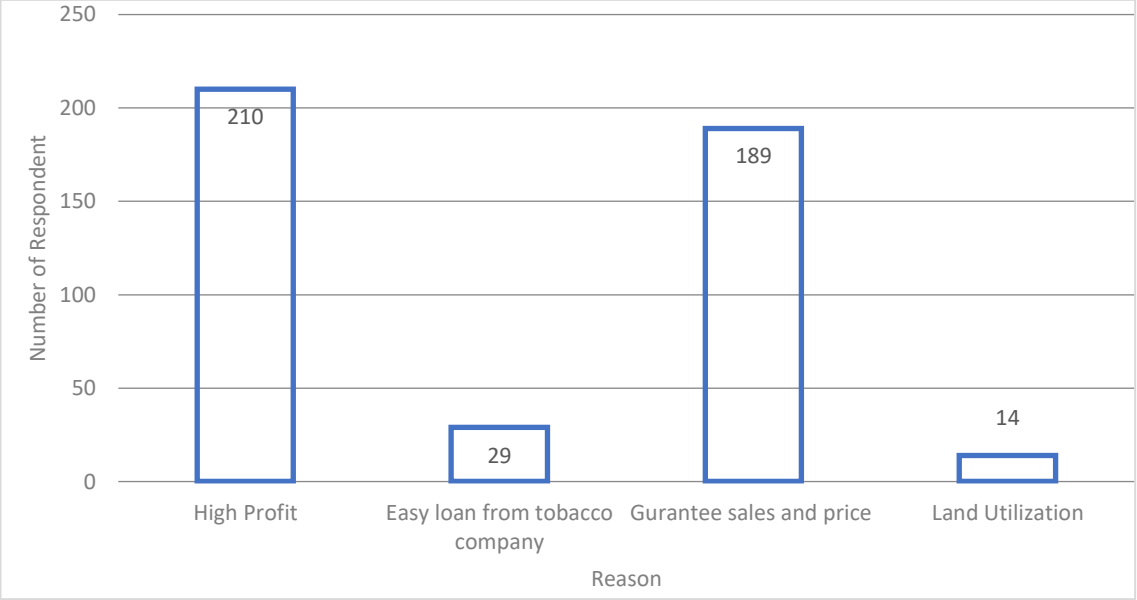
16,000–20,000	37	17.6%
21,000–25,000	36	17.1%
Above 25,000	29	14.0%
Land Ownership		
Own land	91	43%
Lease land	119	57%
Both own and lease	52	25%

Table 1: Occupational and Economic Details
Source: Survey data

4.2 Reason for Tobacco Farming

All respondents cited higher profitability (100%) as the main reason for engaging in tobacco farming. Other reasons included guaranteed sales and pricing (90%), access to company loans (14%), and efficient land utilization (6%).

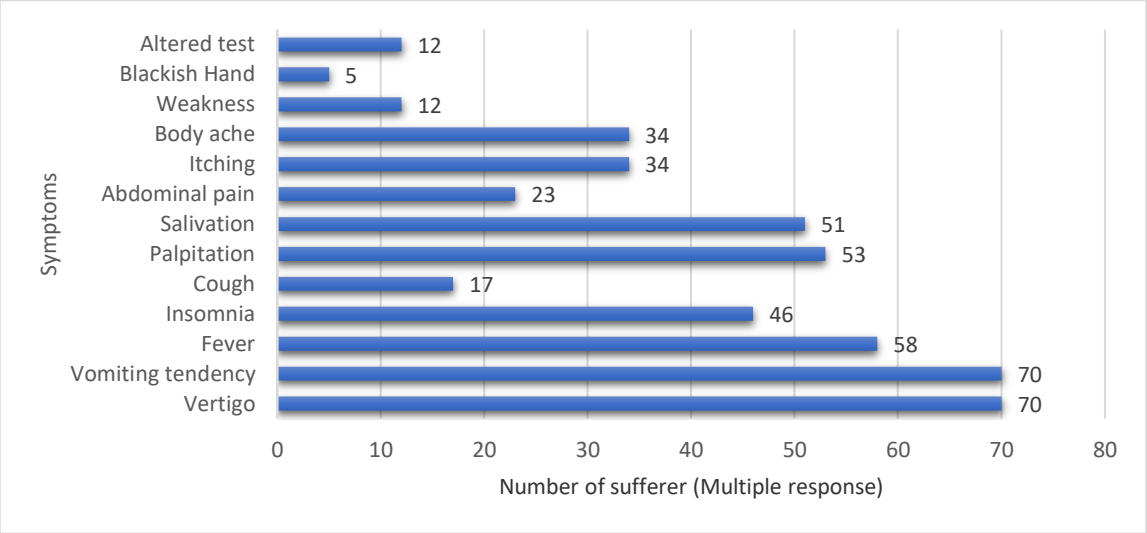
Figure 2: Reason for Tobacco Cultivation (Multiple answer with preference)



4.3 Health Hazards

A majority of respondents reported experiencing health problems associated with their involvement in tobacco cultivation. The most frequently cited symptoms were vertigo and vomiting, affecting 33% of participants. In contrast, less common symptoms included blackish discoloration of the hands (3%) and altered taste perception (6%). Notably, several farmers reported experiencing multiple overlapping symptoms, indicating the potential for cumulative health effects. Despite these findings, 22.38% of respondents (47 individuals) stated that they had not experienced any health complications related to their work in tobacco farming as most of the times they are using personal protective equipment (PPE) during cultivation and processing of tobacco green leaf's.

Figure 3: Type of disease



Among the 32 female respondents, vomiting (34.9%) was the most frequently reported issue. Other symptoms included headaches (11.56%), vertigo (10.11%), fever, body aches, and insomnia, although these were less prevalent.

4.4 Personal Protection and Health Complications

A Pearson correlation analysis revealed a strong negative relationship between the use of personal protective measures and the incidence of health complications among tobacco farmers ($r = -0.713$, $p < 0.001$). This indicates that increased use of personal protective equipment (PPE) is significantly associated with a reduction in health-related issues linked to tobacco cultivation.

Further analysis using linear regression confirmed the robustness of this relationship. The model demonstrated a strong fit ($R = 0.713$; $R^2 = 0.508$), suggesting that approximately 50.8% of the variance in reported health complications can be explained by the level of personal protection employed by the respondents. All the VIF value were found 1.5 indicate no multicollinearity among the variable.

Table 3. Regression Coefficients Personal Protection and Health Complications

Variable	B (Unstandardized)	Beta (Standardized)	t value	Sig.
Constant	2.237	-	31.075	.000
Personal Protecting Equipment (PPE)	-0.618	-0.713	-14.666	.000

The regression equation indicates that for each one-unit increase in personal protecting equipment usage, the predicted score for health complications decreases by approximately 0.618 units. The standardized beta coefficient (-0.713) is consistent with the Pearson correlation value, reinforcing the strength and inverse direction of the relationship between PPE usage and health outcomes.

These findings underscore the critical role of occupational safety practices in mitigating health risks among tobacco farmers. The significant impact of personal protection suggests that policy interventions and awareness campaigns promoting PPE usage could lead to substantial improvements in health outcomes within this population.

4.5 Personal Protection and Treatment Cost

The relationship between personal protection and treatment cost was also moderately negative ($r = -0.419$, $p < 0.001$). This suggests that greater use of personal protection is associated with lower additional treatment expenses. The

regression model yielded R = 0.419, R^2 = 0.175, indicating that only 17.5 % of the variance in increased treatment costs is explained by personal protection measures.

Table 4. Regression Coefficients Personal Protection and Treatment Cost

Variable	B (Unstandardized)	Beta (Standardized)	t	Sig.
Constant	1.500	-	23.378	.000
Personal Protective Equipment usage	-0.250	-0.419	-6.651	.000

The constant (1.500) represents the expected increase in treatment cost when personal protection is absent. For each additional unit usage of personal protection, treatment costs decrease by approximately 0.250 BDT. This effect is statistically significant and practically meaningful. Personal protection was found to significantly reduce health complications and moderately treatment costs in tobacco cultivation.

5. DISCUSSION

This study offers compelling evidence that tobacco farming in Cox's Bazar imposes significant health burdens on farmers, manifesting in both acute symptoms and potential chronic conditions. These findings corroborate previous research conducted in Bangladesh [19,20], as well as other studies [11,17], reinforcing the understanding that occupational exposure to nicotine, pesticides, and sustained physical labor contributes substantially to the high prevalence of Green Tobacco Sickness (GTS) and related health issues.

The most frequently reported symptoms including vertigo, vomiting, headaches, and muscle aches are consistent with the physiological effects associated with transdermal nicotine absorption [3,5]. Crucially, the regression analysis highlights the protective influence of personal protective equipment (PPE): incremental improvements in PPE usage corresponded with significant reductions in both disease incidence and associated treatment costs. This aligns with broader occupational health literature, which identifies consistent PPE use as one of the most effective strategies to prevent work-related illnesses in agricultural sectors specially green tobacco cultivation [11]. The observed negative correlation between PPE use and both health complications and treatment costs under scores a critical gap in occupational safety practices. Barriers to adequate PPE use likely include limited awareness, financial constraints, discomfort in the region's hot and humid climate, and insufficient training regarding proper equipment usage. Interestingly, approximately 22% of farmers reported no health complications. While this could reflect genuine differences in exposure or individual resilience, it may also be attributable to underreporting, limited health literacy, or a cultural normalization of symptoms as inherent to the nature of the work. Gender-specific patterns such as the higher incidence of vomiting among female farmers may be linked to physiological differences in nicotine sensitivity or to variations in task assignments during cultivation. Economic considerations clearly dominate the decision to engage in tobacco farming; all respondents cited profitability as their primary motivation. This highlights a complex challenge, wherein farmers consciously trade off health risks for immediate financial gains. Any effective intervention therefore, address both the health and economic dimensions of tobacco cultivation.

Recommendations

Based on these findings, several key measures are recommended to safeguard the health of tobacco farmers:

1. Tobacco purchasers should be mandated to supply farmers with appropriate PPE. This should be accompanied by practical training to ensure correct and comfortable use, especially considering the challenges posed by hot and humid conditions.

2. Information regarding Green Tobacco Sickness and related health risks should be disseminated through local agricultural support services. Farmer cooperatives and local governance bodies can play a pivotal role in distributing educational materials in regional languages to maximize reach and comprehension.
3. High-risk areas like Ramu upazila should implement regular health screenings for tobacco farmers, particularly during the harvesting season. Offering free or subsidized medical check-ups can facilitate early detection and timely treatment of occupational illnesses.
4. Farmers should be encouraged and supported to transition toward cultivating less hazardous yet profitable alternatives such as vegetables, spices, and fruits. This shift could be facilitated by financial incentives, improved market access, and affordable credit options, easing the economic burden of diversification.

6. CONCLUSION

The health hazards identified in this study are both predictable and largely preventable. The evidence from Cox's Bazar (Ramu Upazila) underscores that, through a combination of effective policy enforcement, community engagement, and targeted economic incentives, it is possible to substantially reduce the burden of Green Tobacco Sickness among tobacco farmers. The fundamental challenge lies not only in implementing protective measures but also in fostering sustainable economic alternatives that enable rural households to prioritize health without sacrificing livelihood.

Declaration by Authors

Ethical Approval: Not Applicable
Acknowledgement: None
Source of Funding: None
Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Atanu Bhattacharjee, Syed Lutful Kabir Chowdhury. Health hazards of tobacco farmers in Bangladesh: a study in cox's bazar district. *Int. J. Sci. Healthc. Res.* 2025; 10(4): 33-41. DOI: *https://doi.org/10.52403/ijshr.20250406*

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