

Stubble Burning in Munshiganj, Bangladesh: Causes, Impacts, and Sustainable Alternatives for Environmental and Public Health

Publication Date: April 25, 2023

Mohammad Tauhidul Islam

Department of Human-centered Design

Userhub, Dhaka, Bangladesh

iamtauhidulislam@gmail.com

Wahid bin Ahsan

Department of Human-centered Design

Userhub, Dhaka, Bangladesh

wahid.ahsan@gmail.com

Abstract

This research report investigates the practice of stubble burning in Munshiganj, Bangladesh, examining its causes, impacts, and potential alternatives. Although stubble burning is a traditional practice, it remains a prevalent method used by farmers for land fertility, potash supplementation, insect control, and cost management. However, this practice contributes to air and environmental pollution and poses public health risks, particularly for children. The report presents alternative uses for stubble, such as organic fertilizer and cooking fuel, and proposes policy measures to regulate the practice. By examining the complex socio-economic and environmental factors that contribute to stubble burning in Munshiganj, this report offers valuable insights into potential solutions for mitigating its negative impacts.

Keywords: Stubble burning, Munshiganj, Bangladesh, environmental impacts, public health, agricultural practices, sustainable alternatives, policy implementation, farmer education, community engagement, economic incentives, infrastructure development, collaboration, air pollution.

Copyright © 2023 Userhub Ltd. All rights reserved.

This research report is an open-access publication, licensed under the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0).

DOI: <https://doi.org/10.58947/A3KH-S8WY>

Introduction

Stubble burning is a significant issue in Munshiganj, Bangladesh, which occurs during the potato harvesting season. Despite efforts to educate farmers and provide alternative methods, the burning of stubble continues to increase in the country (Bangladesh Bureau of Statistics, 2020). This practice results in the release of carbon and nitrogen previously stored in the biomass, leading to air pollution and contributing to global warming due to the emission of CO₂ (Rembon & MacKenzie, 1997). The burning of crop residue in open fields has become a significant concern for climate change mitigation efforts worldwide and has led to air quality impairment, smog, haze, heatwaves, and different health problems (Raza, et al., 2022). This practice also impacts soil fertility and crop yield, affecting both the environment and the economy.

Epidemiological studies have shown that air quality contamination resulting from stubble burning leads to adverse health impacts, as rice straw is often burnt in the fields, resulting in airborne emissions that are hazardous to human and ecosystem health (Korenga, Liu, & Huand, 2001). The air that we breathe can consist of many contaminants, including ozone (O₃), sulfur dioxide (SO₂), particulate matter, volatile organic compounds (VOCs), and nitrogen oxides (NO_x) (Synnefa, et al., 2003) (Lee, Chan, & Chiu, 1999). These contaminants have specific impacts on human health and the environment (Islam, Hasina, Majumder, Hossain, & R, 2017). Atmospheric PM is of great concern to the public and government agencies because of its significant impact on human health, visibility reduction, agriculture, and atmospheric chemistry (Sarker, Yeasmin, Rahman, & MA, 2018).

This research report aims to explore the causes and effects of stubble burning in Munshiganj, Bangladesh, and to identify alternative solutions to this practice. The study focuses on the perceptions and attitudes of farmers towards stubble burning and the impact of this practice on soil fertility, crop yield, and the environment. The significance of this study lies in its potential to provide insights into the factors that contribute to the practice of stubble burning and to identify more sustainable alternatives. The findings of this study could inform policy decisions and strategies aimed at reducing the negative impact of agriculture on the environment and human health.

Methodology

Research Design: This qualitative case study aimed to investigate the causes of stubble burning in Munshiganj, Bangladesh, and explore ways to raise awareness and prevent the practice.

The central research question for this study is "What causes stubble burning in Munshiganj, and how can awareness be raised to prevent it?" The study was guided by five sub-questions (Creswell, 2018):

1. What factors influence farmers in Munshiganj to engage in stubble burning?
2. What knowledge do farmers have about the air pollution caused by stubble burning?
3. How does stubble burning in Munshiganj contribute to air pollution and other environmental issues?
4. What steps can be taken to educate and raise awareness among farmers in Munshiganj about the negative impacts of stubble burning?
5. What are alternatives and policies for managing crop residue and addressing stubble burning in Munshiganj?

Participants: The study included a total of 15 participants, comprising six farmers, eight residents, and one government official from the Department of Agriculture. Recruitment was conducted using purposive and snowball sampling techniques to ensure diversity.

Data Collection: Data was collected through semi-structured interviews consisting of 15 questions, which were recorded with participants' consent and later transcribed for analysis. The average length of the interviews was 10-12 minutes. Additionally, demographic information was collected from participants before conducting the interviews.

Data Analysis: The transcribed data were analyzed using a qualitative content analysis approach (Braun & Clarke, 2006), involving coding, categorizing, and reviewing the data to identify patterns and emerging themes.

Ethical Considerations: The study adhered to ethical guidelines set forth by the American Psychological Association. Informed consent was obtained from all participants, and their anonymity and confidentiality were ensured throughout the study (American Psychological Association, 2017).

Findings

Factors Contributing to Stubble Burning

Several factors contribute to the practice of stubble burning in Munshiganj. Some farmers do not have enough space to store the stubble, leading them to resort to burning the excess materials. Burning unnecessary plants is seen as a way to address issues of pest infestation and manage the cost of straw management. Additionally, some farmers believe that burning the stubble at night reduces the impact of the smoke on people. Finally, there is a perception among some farmers that burning the stubble can have positive effects on soil treatment.

Many farmers in Munshiganj believe that using stubble-burning ash can have a positive impact on the fertility of their land, leading to better crop yields, particularly for vegetables. Several farmers have reported positive results after using the ash in their fields, and some have even found that mixing cow dung with the ash further enhances its benefits for the soil. This traditional practice has been used for generations and is believed to have many beneficial properties for the soil.

According to farmers and agricultural experts, stubble-burning ash can work as a potash supplement for crops. If the soil in cropland has decreased levels of potash, applying the ash can help to recover some of these levels. This traditional practice has been used for generations and is considered by some to be an effective way of supplementing the soil with necessary nutrients.

Agricultural experts suggest that when farmers harvest crops, they often leave behind unnecessary plants, straws, and other debris. These can become breeding grounds for insects, acting as alternate hosts for these pests. To address this issue, some farmers choose to burn these materials and spread the resulting ash onto their fields. This can be an effective way to destroy harmful germs and reduce the risk of pest infestation in crop fields.

Alternatives to Stubble Burning

Villagers commonly use it as a cooking fuel and to fill blank dug spaces. If left unused, the stubble can lead to rotten soil, so using it to fill spaces is a practical solution. Additionally, it can be used for betel leaf cultivation and in cottage industries, and can even be sold. Farmers also use stubble for floating crop beds: they pile the straw together and add vegetable seeds during the rainy season, resulting in good vegetable

yields. Furthermore, stubble can be used to make sheds or cool houses, and mixed with soil for building houses. It is also a valuable source of food for cows.

Agricultural experts and farmers agree that by allowing these materials to decompose, they can transform into compost that can be used to enhance crop growth. One farmer described a process of digging soil, placing straw and other organic materials into it, and allowing it to decompose. They reported seeing positive results in their potato crops, and noted that this method can also be effective for vegetable crops.

Knowledge and Attitudes Towards Air and Environmental Pollution

Most of the farmers believe that the smoke generated from burning straw does not have any adverse effects on the air and environment. In contrast, local residents hold the opposite belief, thinking that the smoke does negatively impact the air and environment. Agricultural experts primarily emphasize the importance of food and agriculture, while recognizing the need to consider the potential pollution of the air and environment for a comprehensive approach to agricultural practices.

Health Impacts of Stubble Burning

Stubble burning usually starts in the afternoon and lasts until midnight, generating dense smoke that can be seen in the neighboring areas. The thick smoke produced by burning stubble makes it difficult to remain indoors, even with closed doors and windows. It can penetrate through closed doors and windows, leading to respiratory problems and unpleasant odors. Children are especially susceptible to the smoke's effects, which may cause eye irritation and other health issues.

Policies and Regulations

As of now, there are no government restrictions in place regarding the burning of straws. Agricultural experts within the government believe that it can be beneficial for the soil and crops, which is why there is no policy to regulate this practice.

Limitations and Challenges

Farmers face challenges with storage space for stubble and often resort to burning it for cooking fuel. However, the cost of transporting the stubble can be prohibitive. Additionally, many farmers lack knowledge about effective straw management practices.

Discussion

The findings of the research highlight the various causes and alternatives to the practice of stubble burning in Munshiganj. The research indicates that many farmers resort to

burning excess materials due to the lack of storage space, which can have adverse effects on the air and environment. However, farmers also believe that burning the stubble can have positive effects on soil treatment, and can lead to better crop yields.

The study found that many farmers believe that using stubble-burning ash can have a positive impact on the fertility of their land, leading to better crop yields, particularly for vegetables. Several farmers have reported positive results after using the ash in their fields, and some have even found that mixing cow dung with the ash further enhances its benefits for the soil. This traditional practice has been used for generations and is believed to have many beneficial properties for the soil.

Additionally, the research highlights the alternatives to stubble burning, such as using the stubble as a cooking fuel, for betel leaf cultivation, in cottage industries, or to fill blank dug spaces. Farmers can also use stubble for floating crop beds, resulting in good vegetable yields. Furthermore, stubble can be used to make sheds or cool houses, and mixed with soil for building houses. It is also a valuable source of food for cows.

The study also found that there are no government restrictions in place regarding the burning of straws. Agricultural experts within the government believe that it can be beneficial for the soil and crops, which is why there is no policy to regulate this practice. However, the research highlights the health problems associated with stubble burning, such as respiratory problems and unpleasant odors, especially for children.

The findings suggest that there is a need for greater awareness and education regarding the effects of stubble burning on the environment and health. Farmers can benefit from learning about effective straw management practices and alternatives to stubble burning. Policymakers may consider developing regulations to limit the adverse effects of stubble burning on the environment and health, while still preserving the benefits of the practice for soil treatment and crop yields.

Overall, the research highlights the complex issues surrounding the practice of stubble burning and the need for a multifaceted approach to address the challenges and opportunities associated with the practice.

Recommendation

Based on the research findings, several recommendations can be made to address the issue of stubble burning in Munshiganj:

1. Encourage the use of stubble as organic fertilizer: Educate farmers on the benefits of composting stubble and encourage them to adopt this practice, as decomposed stubble can serve as an effective organic fertilizer.
2. Promote research: Encourage government and non-government organizations to research stubble burning and its alternatives to better understand its benefits and drawbacks. Share research findings with farmers to support informed decision-making.
3. Educate farmers and raise public awareness: Organize workshops and training programs to inform farmers about effective stubble management practices, such as composting, using it as cooking fuel, or employing it as building material. Additionally, launch campaigns to inform the broader population about the environmental and health impacts of stubble burning, building support for policy measures and promoting a shift toward sustainable practices.
4. Implement government policy: Introduce government policies to regulate stubble burning, discourage its practice, and encourage alternative methods, considering the negative impacts on air quality and public health.
5. Develop community-based solutions: Engage local communities in identifying and implementing sustainable alternatives to stubble burning, such as community workshops or local cooperatives for crop residue collection and processing.
6. Provide economic incentives and improve infrastructure: Offer financial incentives like subsidies or grants to farmers who adopt alternative practices, helping them offset costs associated with transitioning to new methods. Also, invest in infrastructure and technology for the transportation, storage, and processing of crop residues, such as collection centers or machinery for residue management.
7. Foster collaboration: Encourage collaboration among stakeholders, including farmers, agricultural experts, government officials, and NGOs, to develop comprehensive solutions for addressing stubble burning.
8. Monitor and evaluate progress: Regularly assess the effectiveness of implemented measures to reduce stubble burning and its impacts, using collected data to refine strategies and make necessary adjustments for long-term success.

Addressing the issue of stubble burning in Munshiganj is crucial to improving air quality, reducing health problems, and promoting sustainable agricultural practices. Encouraging the use of stubble as organic fertilizer, conducting research, educating farmers, and implementing government policies can lead to positive change.

Conclusion

Stubble burning is a common practice in Munshiganj, driven by factors such as land fertility, insect control, and cost management. However, it has negative environmental and public health consequences, including respiratory problems for children. The government needs to take action by researching and educating farmers about sustainable alternatives like using stubble as organic fertilizer, which can enhance crop growth and reduce pollution. It is also important to increase awareness among farmers and the public about the harmful effects of stubble burning and promote sustainable practices for a healthier and more sustainable agricultural system. With proper policies and education, a better future for both farmers and the environment can be achieved.

Acknowledgment

We express our sincere gratitude to Userhub for providing us with the opportunity to conduct this research as part of their human-centered design course. Their support and guidance have been invaluable in completing this study.

We also extend our heartfelt appreciation to the farmers and residents of Munshiganj who generously provided us with their time and insights for this study. Without their cooperation and willingness to share their experiences, this research would not have been possible.

Opportunities for Future Research

While this research provides valuable insights into the causes and alternatives to stubble burning in Munshiganj, there are still many opportunities for further research in this area. One of the main limitations of this study is its small scope, as it only focuses on two villages within the district. To obtain a more comprehensive understanding of the issue, future research should aim to gather data from a larger sample size across the district.

Another limitation of this study is the difficulty in obtaining interviews with experts and environmental professionals in the area. Future research could benefit from engaging

with these experts to gain a more in-depth understanding of the potential environmental impacts of stubble burning, as well as possible solutions to address the issue.

One area of potential research could be to further explore the benefits of using stubble as organic fertilizer. While this study suggests that farmers in Munshiganj have had success with this practice, additional research could be conducted to examine the efficacy of different methods of using stubble as fertilizer and the potential impacts on soil quality and crop yields.

Finally, there is a need for greater education and awareness-raising efforts among farmers about alternative methods of straw management and the potential harms of stubble burning. Future research could explore ways to effectively engage with farmers and provide them with the necessary knowledge and resources to adopt sustainable practices. This could include partnerships with government and non-governmental organizations to conduct research, as well as provide education and outreach programs in the area.

Declaration of interest

The authors of this study declare that they have no financial or personal relationships with any individuals or organizations that may have influenced the conduct or reporting of this research. They also declare that there are no conflicts of interest that could potentially impact the conduct or reporting of this research.

References

- American Psychological Association. (2017). *Ethical principles of psychologists and code of conduct (2002, amended effective June 1, 2010, and January 1, 2017)*. Retrieved from <http://www.apa.org/ethics/code/index.html>
- Bangladesh Bureau of Statistics. (2020). *Statistical Yearbook*. Retrieved from https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/b2db8758_8497_412c_a9ec_6bb299f8b3ab/2021-08-11-04-54-154c14988ce53f65700592b03e05a0f8.pdf
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- Creswell, J. W. (2018). *Research design: qualitative, quantitative, and mixed methods approaches*. Sage Publications.
- Islam, M., Hasina, M., Majumder, P., Hossain, M., & R, K. (2017). Monitoring and assessment of physicochemical parameters of soils and coals used in brick kilns and their impact on health and environment. *Proceedings of the VIII International Agricultural Symposium "Agrosym 2017"*, (pp. 1689-1695). Jahorina, Sarajevo, Bosnia & Herzegovina.
- Korenga, T., Liu, X., & Huand, Z. (2001). The influence of moisture content on polycyclic aromatic hydrocarbons emissions during rice straw burning. *Chemosph Glob Chang Sci, 3*, 117-122. [https://doi.org/10.1016/S1465-9972\(00\)00045-3](https://doi.org/10.1016/S1465-9972(00)00045-3)
- Lee, S., Chan, L., & Chiu, M. (1999). Indoor and outdoor air quality investigation at 14 public places in Hong Kong. *Environment International, 24*, 443-450. [https://doi.org/10.1016/S0160-4120\(99\)00019-7](https://doi.org/10.1016/S0160-4120(99)00019-7)
- Raza, M., Abid, M., Faisal, M., Yan, T., Akhtar, S., & Adnan, M. (2022). Environmental and Health Impacts of Crop Residue Burning: Scope of Sustainable Crop Residue Management Practices. *International Journal of Environmental Research and Public Health, 19*, 47-53. <https://doi.org/10.3390/ijerph19084753>
- Rembon, F., & MacKenzie, A. (1997). Soybean nitrogen contribution to corn and residual nitrate. *Canadian Journal of Soil Science, 77*, 543-551. <https://doi.org/10.4141/S96-096>

- Sarker, R., Yeasmin, M., Rahman, M., & MA, I. (2018). People's Perception and Awareness on Air Pollution in Rural and Urban Areas of Mymensingh Sadar Upazila. *Progressive Agriculture*, 22-32. <https://doi.org/10.3329/pa.v29i1.37477>
- Synnefa, A., E, P., E, P., M, S., G, M., P, D., . . . A, G. (2003). An experimental investigation of the indoor air quality in fifteen school buildings in Athens, Greece. *International Journal of Ventilation*, 185-201. <https://doi.org/10.1080/14733315.2003.11683664>

This research report presents the authors' perspectives, which may not align with Userhub Ltd.'s official stance. Intended for general information purposes, this report should not be treated as legal or professional advice. Userhub Ltd. makes no warranties regarding the report's accuracy or reliability. Users are advised to exercise caution and consult relevant professionals, as Userhub Ltd. accepts no liability for any loss or damage resulting from the report's use.