



AGRICULTURE AND SOCIO-ECONOMIC IMPACTS OF LAND USE CHANGES IN DHAMRAI

RABEYA AKTER^{a1}, MD. MAMUN HOSSAIN^b, MD. MAHADI MORSHED^c AND ASIA AKTER^d

^aDepartment of Environmental Science, Jahangirnagar University, Savar, Bangladesh

^{bc}Bangladesh Agricultural Research Institute, Gazipur, Bangladesh

^dDepartment of Plant Sciences, University of Idaho, Moscow, Idaho, USA

ABSTRACT

Land use change is a complex phenomenon that has a significant impact on the environment, society, and economy. The Dhamrai area, located in Bangladesh, has experienced substantial land use change over the past few decades due to rapid urbanization, population growth, and industrialization. This study aims to explore the impact of land use change on the Dhamrai area. The results indicate that there has been a significant decline in agricultural land and an increase in built-up areas, forests, and water bodies. According to the Upazilla Agriculture office, more than 300 brick kilns has increased in Dhamrai, which causes loss of agricultural land, air pollution and soil degradation. The conversion of agricultural land to built-up areas has resulted in the loss of fertile land and increased pressure on the remaining agricultural land to meet the growing demand for food. This study also highlights the social and economic impacts of land use change in the Dhamrai area. The conversion of agricultural land to built-up areas has led to the displacement of farmers and loss of livelihoods. However, in many cases, land use change can have negative impacts on crop production and crop fields. The production of Aman paddy was 1.14 ton in 7340 hectares in 2022, which was 1ton in 1097 hectares in 2002, which clearly indicate the decrease of Aman production by 0.015%. The increase in built-up areas has also resulted in the loss of open spaces and recreational areas, leading to a decline in the quality of life of the residents. In conclusion, the study shows that land use change in the Dhamrai area has significant impacts on the environment, society, and economy.

KEYWORDS: Land Use Change, Population, Urbanization, Soil Pollution

Land use change refers to the process of converting land from one use type to another. This can include changes in land use from natural ecosystems such as forests, grasslands, and wetlands to agricultural or urban land use, or changes in land use within the same category, such as the conversion of pastureland to cropland. Land use change can have significant impacts on the environment, society, and the economy. It can lead to changes in soil quality, water availability, and biodiversity loss, as well as increased greenhouse gas emissions and climate change. Changes in land use and cover (LUC) brought on by local climatic and geomorphological factors affect the land faster. Additionally, land use change can affect communities by altering access to natural resources and creating social and economic inequalities. The drivers of land use change include population growth, urbanization, agricultural expansion, and infrastructure development. Effective land use planning and management strategies are necessary to mitigate the negative impacts of land use change and promote sustainable development. Deforestation has significantly changed and fragmented the Earth's vegetative cover, along with urban development, agriculture, and other human activities. Due mostly to

tropical and subtropical deforestation, land use changes are the second largest human-induced source of greenhouse gas emissions. However, in many cases, land use change can have negative impacts on crop production and crop fields. They can also have an impact on local, regional, and global climate.

METHODOLOGY

Selection of Research Area

The union of Dhamrai, Bhararia, and Kulla hosted the study. Both qualitative and quantitative methods have been used in the study to gather and analyse data. To gather data, both primary and secondary sources were used. Between December and January 2023, focus groups, key informant interviews, home visits, and personal observations served as the primary data collection methods. In order to gather secondary data, it was necessary to evaluate a variety of academic and policy studies (Figure 1).

1. Source of information Primary: (collected through survey questionnaires from 100 Respondents)
2. Secondary: (KII, FGD, Household-Interview, literature review)

¹Corresponding author

Location Map



Figure 1: Location of the Study Area (Source: Dhamrai Paurashava Office, 2018)

DATA COLLECTION

Data from the respondents were gathered by the study using two different types of questionnaires. They are:

1. Closed-ended queries: A single option (yes or no) was available for the respondent to select.
2. Open-ended questions: Free-text responses were allowed on this question paper for open-ended questions. Regarding expressing one's own views, there are no limitations.

RESULTS AND DISCUSSION

Findings and Evaluation

A Purposive Sampling-based approach has been used to choose respondents and collect data from them. Analysis has been done on respondents' addresses, occupations, and demographic data like age, education, and gender. The graph shows that respondents aged 15 to 25 make up about 6% of the total, followed by those aged 26 to 35 is 29%, 23% between the ages of 36 and 45, and 14% between the ages of 46 and 55. Age 56+ has the lowest percentage, at 7%. As can be observed, nearly every responder provided data to the study in roughly equal amounts. The least amount of data was only given to people 56 years and older (Figure 2).

Analysis of Data by Educational Qualifications

An understanding of signing and education levels ranging from first to fifth grade provided the most information by respondents. Nearly equal weight has been given to gathering data from respondents with Honours/Graduate educational credentials when estimating the number of SSC and HSC qualifications. There are accordingly 99%, 43%, 37%, and 17% of them. The Master's degree generated the least amount of data holders which is 2% (Figure 3).

Analysis Data by Gender

As can be seen in the (Figure 4) the most data were collected from female 55% and male 45% (Figure 4).

Analysis Data by Occupation

According to the result, 35% of data were obtained from housewives, 24% from farmers, 18% from employees, 18% from businessmen, and 2% from students (Figure 5).

Cause of Land Use Change

One major cause of land use change is urbanization and the expansion of cities and infrastructure. Population growth and economic development demand increased infrastructure, converting natural areas into urbanized areas. Urbanization can result in the loss of valuable agricultural land, destruction of

natural habitats, and fragmentation of ecosystems. Another significant cause of land use change is agricultural expansion. As the global demand for food and other agricultural products increases, there is pressure to convert more land for farming. Industrial activities and extractive industries such as mining also contribute to land use change. Other factors that contribute to land use change include population growth, changes in land ownership and land tenure systems, economic factors

such as market demand and profitability, and government policies and regulations (Figure 6).

We found that LUC brick kiln change attributed to 97% industry, 67% urbanization, 82% land occupation, and 80% land business.

Present Scenery of Land Use Change

In the (Figure 7) we can observe the Dhamrai' present scenario of land use changes.

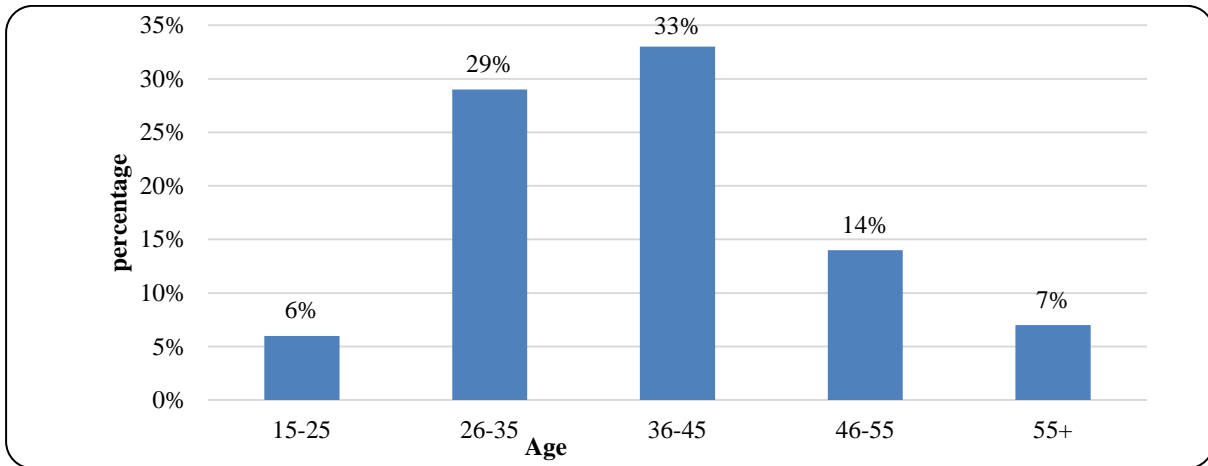


Figure 2: Analysis data by Age

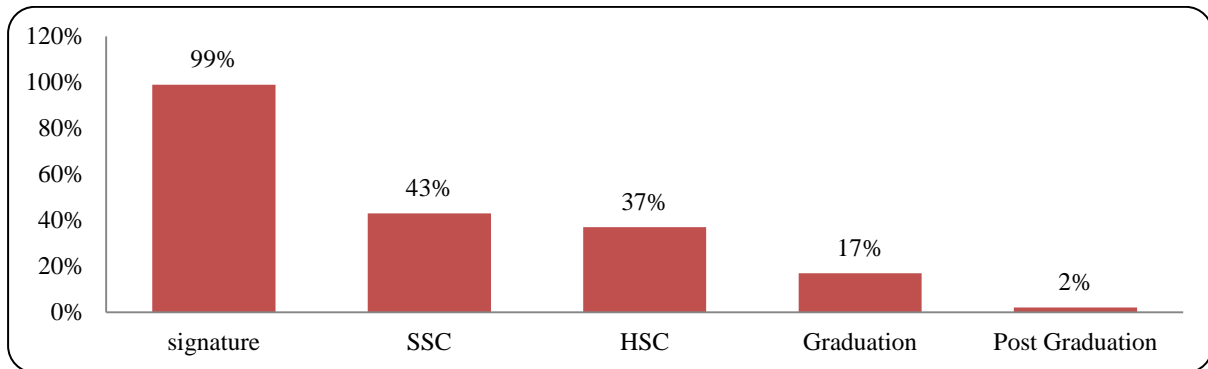


Figure 3: Analysis data by Educational Qualifications

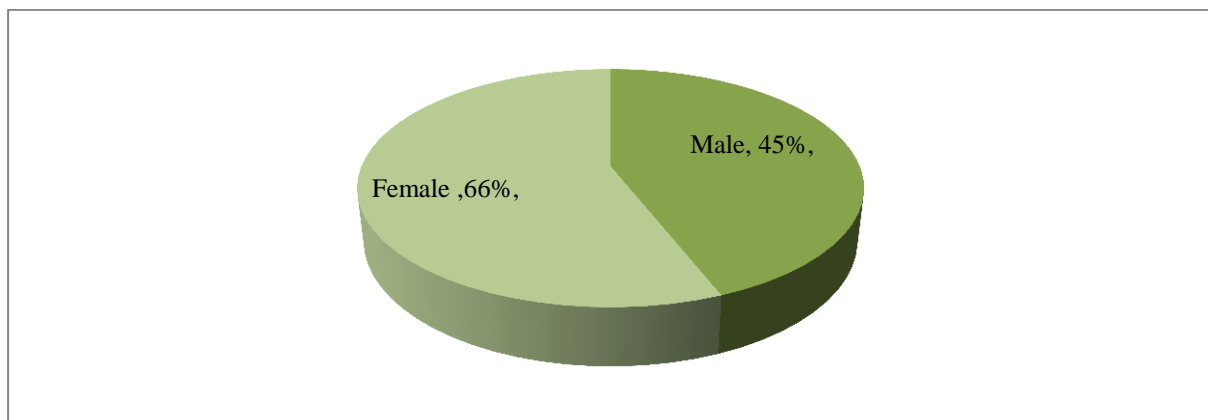


Figure 4: Analysis data by Gender

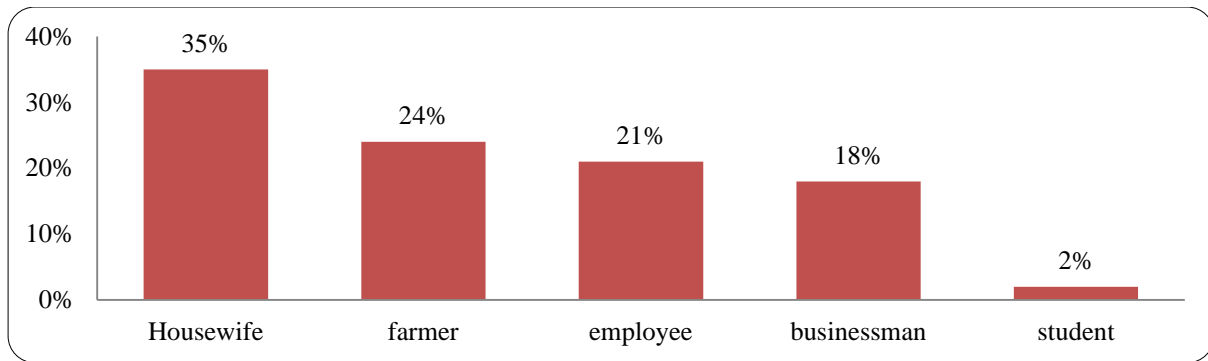


Figure 5: Analysis data by occupation

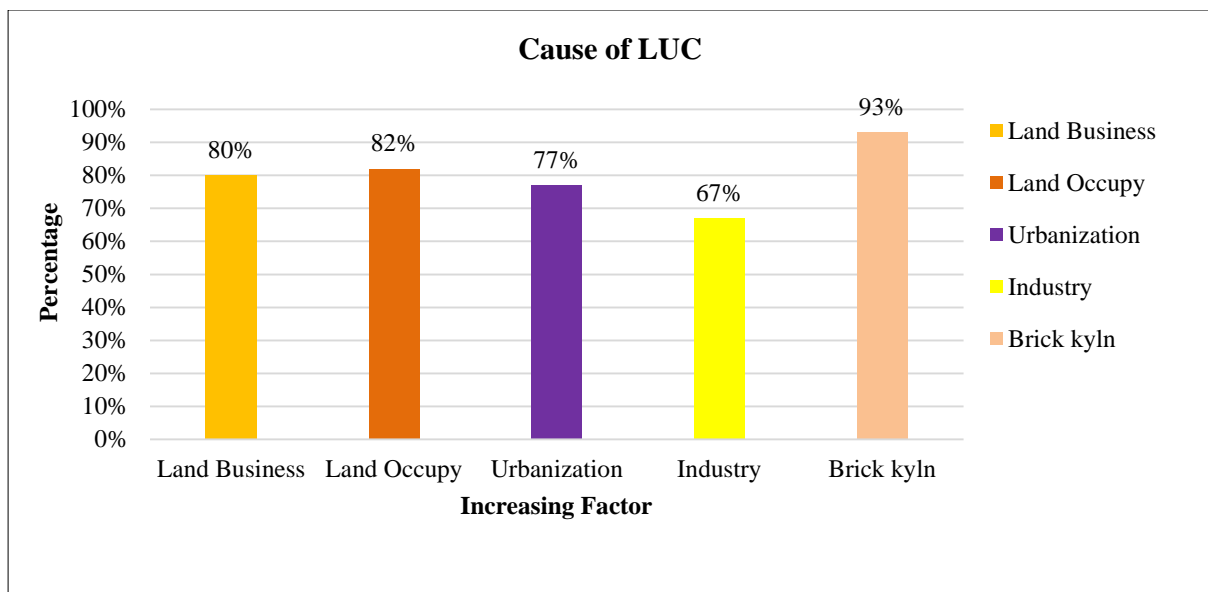


Figure 6: Cause of Land Use Change



Figure 7: Present Scenery of Land Use Change in Dhamrai

Impacts of Land Use Change

The rapid rate of LUC refers to the quick conversion of land from one use to another, often resulting in significant alterations to ecosystems, social and economic structures, and the natural environment. This change can occur due to various reasons such as urbanization, agricultural expansion, industrialization, and mining. The consequences of rapid land use change can be far-reaching and can result in negative impacts on the environment, such as deforestation, soil erosion, loss of biodiversity, and habitat destruction. It can also lead to

social and economic challenges, such as displacement of communities, loss of traditional livelihoods, and increased pressure on resources. For the contiguous United States, we predict land-use change from 2001 to 2051 under two scenarios that reflect the continuation of 1990s patterns and high crop demand more indicative of recent history (Joshua *et al.*, 2014). For farmers on the periphery of metropolitan areas, urbanization offers several obstacles. Farmers on the periphery of metropolitan areas worry a lot about disputes with non-farm neighbours and vandalism, which can result in

damage to crops and farm machinery (Lisansky, 1986). As shown in the (Figure 7) 87% answered yes, 5% answered no, 7% did not know and 66% answered no answer regarding the rapid rate of Land Use Change in rural areas of Dhamrai Upazilla. Analysing the opinions of the respondents, it can be seen that 'inflow' is increasing in the rural areas of Dhamrai Upazilla.

According to (Lopez, 1988), urbanization can also result in the "impermanence syndrome," which discourages the purchase of new equipment or technology and causes farmland to sit idle. Highways impact agriculture, causing pollution and crop depletion; urbanization increases migrant population in rural areas, according to 67% of respondents, urbanization boosts migrant inflow.

The argument over sustainable development center on changes in land use and land cover, one of the primary causes behind environmental change on a global scale. Various factors are impacted by changes in land use and land cover. A variety of environmental and geographic characteristics, such as the quality of water, land, and air resources, ecosystem processes, and the functioning of the climate system due to greenhouse gas fluxes and surface albedo impacts. In contrast to a few years ago, when the majority of land-use and land-cover change research was concentrated on land-cover conversions (such as deforestation and urbanization), academics have come to realize that subtler mechanisms

that result in a modification of land cover demand more attention. (Lambin, 2000) As can be seen from above table 10, 100% of the respondents in the rural parts of Dhamrai Upazilla blamed factory smoke, industrial waste, and human waste generated during factory labour for the environmental aspects of air, soil, and water pollution Analysing the findings of the table, it can be observed that industries have been accused as the major and only cause of environmental contamination. LUC in the studied region is mostly a result of industrialization, Urbanization.

Agricultural Land

Land use change can indeed decrease agricultural land. Land use change refers to the process of converting land from one use to another, such as converting agricultural land to urban or industrial land, or converting forests or other natural areas to agricultural land. When agricultural land is converted to other uses, such as urbanization or industrialization, it reduces the amount of land available for agriculture. This can have significant impacts on food security and the livelihoods of people who depend on agriculture for their income. With consistently high rates of 13 million hectares of deforestation per year, the conversion of forests to agricultural systems is the most common type of land use change (FAO, 2006). According to the Upazilla Agriculture Office, the amount of land has decreased from 2002 to 2022 (Figure 8).

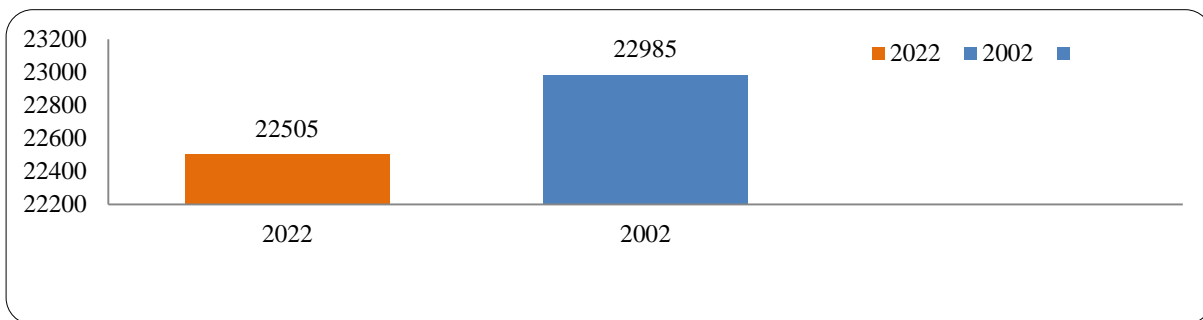


Figure 8: Agricultural Land decrease; Source: Upazilla agricultural office, Dhamrai

Land use change can lead to a decrease in the types of agricultural land, as land is converted from agricultural use to other uses such as urbanization or industrialization. When the respondents were asked about their land conversion pattern, 43% said spontaneous, 40% forced, and 17% situation obtrude.

Decrease of Crop Land

Land use change impacts crop production and fields, potentially increasing production by converting unsuitable land into productive land. However, it also fragments large agricultural landscapes, making it

difficult for farmers to manage fields and reducing crop yields. Bangladesh's coastal LULC pattern faces climatic shocks and pressures, hindering sustainable land use. (Ziaul, 2022) When fields are divided into smaller patches or surrounded by non-agricultural land uses, it can increase pest and disease pressures, reduce pollinator populations, and limit the ability of farmers to adopt sustainable agricultural practices. Table shows jute cropland growth from 4350 hectares in 2002 to 8250 hectares in 2022, Mustard from 6150 hectares to 5130 hectares, Wheat from 900 hectares to 70 hectares, Boro local from 24 hectares to 750 hectares (Figure 9 & 10).

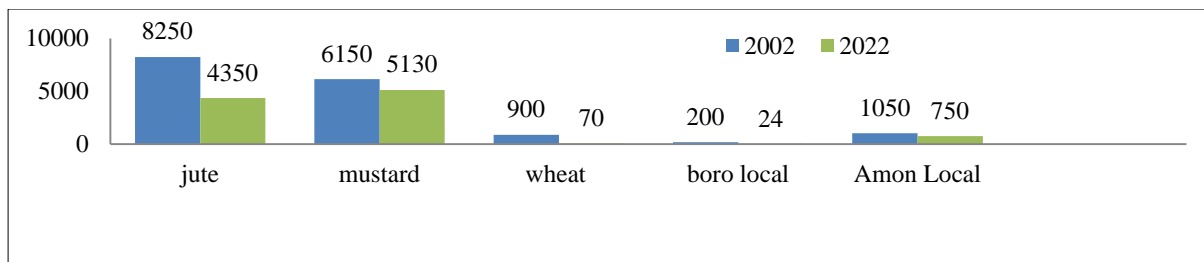


Figure 9: Decrease of Crop land (Source: Upazilla Agricultural Office, Dhamrai)

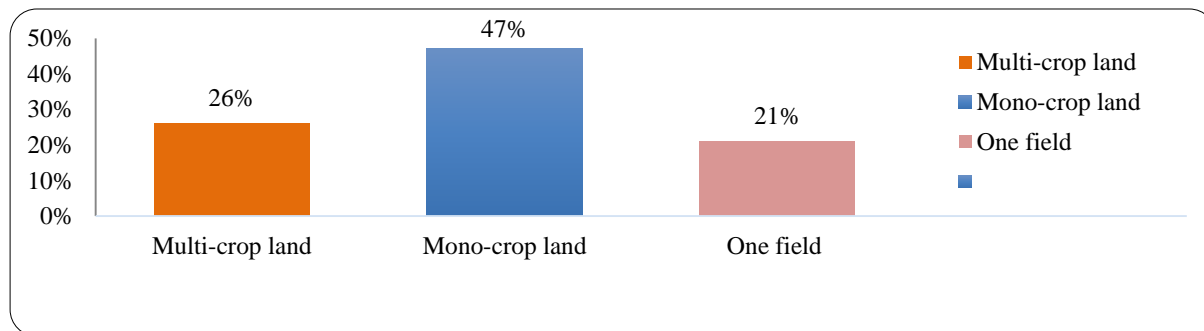


Figure 10: Types of Field Land of study are

It was observed that 47% of the Respondents said that their cultivation agricultural land is mono type field amounting to 47%, multi-crop field 26%, and one field 21%.

Decrease in Crop Production

Land use change negatively impacts crop production, reducing yields and making it difficult for farmers to make a living. It leads to the loss of valuable agricultural land and resources, such as water and nutrients. Conversion for urbanization, infrastructure, or mining also reduces crop production, resulting in

decreased yields and higher food prices. Results from six Mid-Atlantic States over the period 1949 to 1997 indicate that counties with fewer agricultural acres lost farmland at a faster rate. (Lynch, 2003). Land loss and use change can lead to soil degradation, reduced crop yields, and limited crop types. Deforestation can reduce rainfall, causing drought and crop failure. Water resources are also affected. In the (Figure 10) it has been seen that the production of Aman paddy was 1.14 tons in 7340 hectares, which was 1ton in 1097 hectares, which clearly indicate the decrease in Aman production .015%, Similarly Corn 0.26%, and Lemon 4.81% (Table 1).

Table 1: Change of crop production in study area over time

Crops	2022	2002	Percentage of Decrease
Aman paddy	1.14 Ton in 7340 Hec.	1 Ton in 1097 Hec.	0.015%
Corn	9 Ton in 3387 Hec.	5 Ton in 50 Hec.	0.26%
Lemon	26.5 Ton in 550 Hec.	26 Ton in 2 Hec.	4.81%

Negative Impacts of Brick Kiln

Brick kilns in Dhamrai contribute significantly to the environment and public health, causing air pollution and respiratory problems. They consume energy, release carbon, and create particulate matter, contributing to climate change. Land use changes in Dhamrai can negatively impact these kilns. It is expanding as a result of the cities, towns, and villages' increased need for bricks as a result of the rapid economic expansion, urbanization, and wealth. (Ashif, 2022). Dhamrai's brick kilns cause deforestation, soil erosion, biodiversity loss, and climate change. They also require large amounts of water, often contaminated with pollutants, causing harm to aquatic life and humans.

Land Degradation

Clay extraction for brick production causes land degradation, soil erosion, and ecosystem impact. Urbanization leads to soil loss, water infiltration, and altered microclimate, potentially causing floods. Large tracts of land have been cleared of trees or drained, altering the antecedent soil moisture and causing erosion. (Rogger *et al*, 2017). Changes in infrastructure projects, such as roads and dams, can cause soil erosion, reduced agricultural productivity, and ecosystem disruption. The fertile portion of soil is known as top soil; if this is lost due to a backward farming technique, the land is very unproductive in growing crops. Top soil can also be lost due to wind and water erosion. (Zewide, 2021)The

conversion of forests to other land uses, such as agriculture or urban development, can lead to land degradation.

Social Security

LUC, or land use conversion, can create employment opportunities and increase employment, contributing to social security programs. However, it can also lead to migration, putting pressure on social security programs. This can displace people from their homes and land, causing economic hardship and making them ineligible for social security programs.

Economic Discrimination

Land use changes can have significant economic consequences for those relying on land for livelihoods, especially if they are forced off or lack comparable opportunities. Displacement of indigenous communities, for example, may result in lost traditional livelihoods and marginalized groups from decision-making processes. Between 1997 and 2008, there was a decline in the proportion of men and women working in the agricultural sector (as a result of the country being more industrialized countries) (Adekola *et al*, 2013) This can happen in a number of ways, such as through the unequal distribution of resources and opportunities, systemic

biases in the policies and regulations governing land use, or the exploitation of vulnerable populations for profit. 67% respondents said yes, 30% said No and 2% no idea about the opinion of Economic discrimination.

Health Issue

The emissions from brick kilns can cause a range of health problems, including respiratory diseases, heart disease, and cancer. Approximately 3 million people each year die from air pollution, according to the WHO. Each year, 800,000 of them succumb to lung cancer, cardiovascular ailments, and respiratory illnesses that are brought on by outdoor air pollution (WHO, 2000) Workers in brick kilns are also at risk of developing occupational health problems, such as heat stress and musculoskeletal disorders. Since people are exposed to so many different contaminants throughout the course of their lifetimes at varying amounts, it is challenging to determine how many people worldwide die or become ill prematurely as a result of air pollution (Pariyar *et al*. 2013). This can lead to water pollution, which can affect the health of people who use the water for drinking, swimming, or other activities. It can be seen in (Figure 11) that 57% report long-term respiratory disease, 38% skin disease due to industry pollution, and 5% other diseases for a long time,.

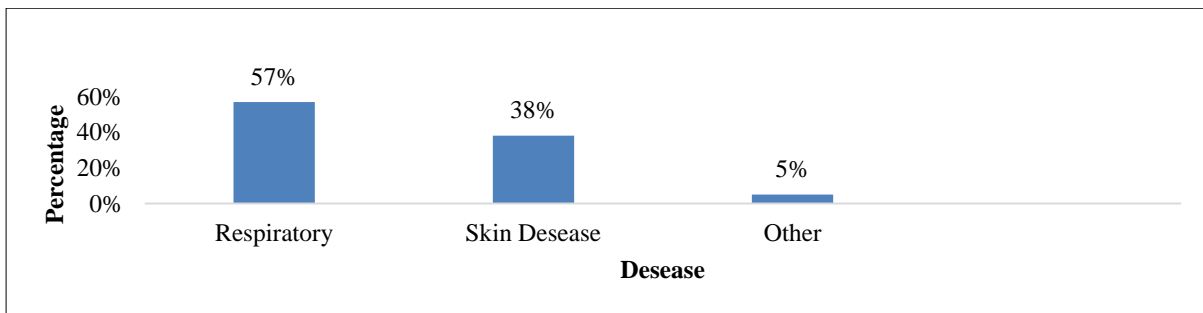


Figure 11: Health issues of study are due to land use change

CONCLUSION

To address the challenges posed by rapid land use change, it is essential to have effective policies and regulations in place that balance economic development with environmental sustainability. This requires collaboration between governments, industries, and local communities to ensure that land use changes are carried out in a responsible and sustainable manner. Additionally, promoting awareness and education about the impacts of land use change can also help individuals and communities make informed decisions about how to manage their land resources. There were several limitations that the researcher had to face during the whole process of this work. Time limitation was a vital issue to manage and complete the field work since the

data collection for a longer duration gives more authentic results. Most of the participants did not have enough knowledge to answer the required questions and also not ready to give consent in participating the research. Another vital challenge lies with the wrong impression that the owners of the brick kilns make. There are more than 300 brick kiln owners arguing that the field over which these brick kilns are made, are one crop land. On the other hand, when the researcher focused on the FGD of the farmers, it is found that the agricultural lands around most of the brick kiln industries are two cropped lands. The researcher faced challenges in authenticating data for assessing agricultural and socio-economic changes, but more studies are needed to assess these areas effectively.

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