**CSE 499B (Section 04)**

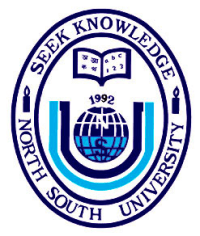
**Project Impact and Sustainability (CO2)**

**Project Title:** Plant Diseases Detection Using Image Processing

**Submitted To**

**Dr. Shazzad Hosain (SZZ)**

**Date: 04/05/2025**



**Group 3**

**Group Members**

|  |  |
| --- | --- |
| **ID** | **Name** |
| 2011892042 | Akib Hasan |
| 2011566042 | Tania Akter Lima |
| 2012959042 | Naima Homaira Khan |
| 2012464042 | Abroor Zahin Niloy |

**Discussion:** During the development of our plant disease detection system using deep learning, we considered various economic, environmental, social, political, ethical, and health and safety aspects, particularly in the context of Bangladesh. As we know that Bangladesh is an agriculture based country. So, economically this system holds great potential in our agriculture sector by reducing crop losses, improving yield, and minimizing pesticide use. Things like these can leave a huge impact in an agriculture-based economy like Bangladesh. But the financial limitations of rural communities, along with limited access to smartphones and internet connectivity, can restrict widespread adoption. Beyond farming, our project also brings value to gardeners and nursery owners, providing them with a quick and accessible way to monitor plant health. The model is capable of detecting around 45 diseases across different types of trees, making it a versatile tool in various agricultural and horticultural settings.

From an environmental point of view, our system encourages better and more sustainable farming by helping reduce the overuse of pesticides. This is very important in rural areas of Bangladesh, where too much use of chemicals can damage soil quality and pollute water sources. By detecting plant diseases early farmers can apply treatment only when needed which protects the environment. However, training deep learning models requires a lot of computer power and electricity and also collecting and building a huge dataset can be challenging for a country like Bangladesh.

This system is also very helpful socially because it gives farmers direct access to advanced technology for identifying plant problems. It reduces the knowledge gap between farmers in rural areas and agricultural experts. One important consideration is digital literacy. Some farmers, especially older ones or those with limited education, may find it hard to use the app. To overcome this, we made sure the app is available in Bangla language, which helps users understand and interact with it more easily.

# **1.Economics (cost) impact:**

From an economic perspective, our project was developed in a cost-effective manner since all the technical work including model training, website development, and app creation was done by the four members of our team using our personal computers. We did not require any specialized or expensive hardware. The main cost we encountered was related to upgrading and modifying existing plant disease image datasets to make the model more accurate for crops and disease types commonly found in Bangladesh. Since there is limited publicly available data specific to our region, we had to invest considerable time and effort into collecting, organizing, and labeling images to reflect local agricultural conditions.

The website and app can be deployed and distributed at a minimal expense, especially with the availability of affordable hosting and cloud services.

Lastly, the system can bring economic benefits to users such as farmers and nursery owners by helping them detect diseases early, reduce pesticide usage, and avoid large-scale crop losses. These savings in operational costs make the tool economically valuable in the long run, especially in a country like Bangladesh, where agriculture plays a vital role in the economy and many farmers operate with limited budgets.

# **2.Environmental impact of the product:**

Our plant disease detection system has a relatively low direct environmental impact since it is a software-based solution that does not rely on physical manufacturing or hardware components. But our product contributes positively to the environment by helping reduce the excessive and often unnecessary use of pesticides and chemical treatments. In many rural areas of Bangladesh, overuse of such chemicals is common due to the lack of early diagnosis and guidance which leads to soil degradation and water pollution. Our system enables timely disease detection which encourages more responsible use of pesticides and reduces harm to the environment. As our solution runs on devices already owned by users like smartphones and computers it does not create additional competition for natural resources or contribute to electronic waste. This aligns with the goals of sustainable farming practices promoted by environmental authorities and agricultural extension programs in Bangladesh.

# **3.Social impact of the product:**

The plant disease detection system we developed has several important social impacts, especially in the context of Bangladesh’s agriculture-based society. Traditionally farmers in rural areas rely on visual inspection or local experts to identify plant diseases a process that can be slow, inaccurate, cost ineffective or even unavailable in remote regions. Our system automates this task by allowing users to upload a leaf image and receive instant feedback about the plant’s health. As our system supports Bangla so it will be also very handy to use for our farmers. While this automation may reduce reliance on manual inspection but it does not threaten jobs in the traditional sense. Instead it supports farmers in making quicker, more informed decisions, and can reduce crop loss and economic stress, particularly for small-scale growers.

In fact, the system may help create new opportunities in digital agriculture. As more farmers adopt such technologies, there is potential for the rise of new roles such as field-level tech support agents, local trainers for app usage, or data collectors who can assist in improving and updating regional datasets.

# **4.Challenges in developing products from project prototype:**

Turning our plant disease detection system from a project prototype into a widely usable product comes with several challenges. Since our solution is software-based and already functional through a website and Android app, it has strong potential to be translated into a saleable product. One major advantage is that it does not require physical manufacturing making it highly cost-effective. Once developed, the cost per unit is very low mainly limited to server hosting, app maintenance, and occasional updates. This makes it easy to scale without large investments in hardware or logistics. But a key challenge lies in reaching and educating potential users, especially rural farmers who may be unfamiliar with using mobile apps or have limited internet access. Another challenge is earning user trust in the system’s accuracy especially when it replaces manual inspection or expert opinion.

We also need to keep the perceived product cost reasonable. While many users expect digital tools to be free, we can consider offering basic features for free and advanced options (like treatment recommendations or expert support) under a low-cost subscription. Collaborations with agricultural organizations, NGOs, or the government could help with promotion and financial support. Overall, while there are challenges, with the right outreach and support systems, our prototype has strong potential to become a practical and widely adopted solution.

# **5.Sustainability of the project**

Ensuring the long-term sustainability of our plant disease detection system after the prototyping stage will require both proper planning and external support. Since the core development is complete, future funding will mainly be needed for server hosting, model updates, user support, and outreach. We plan to seek funding through partnerships with agricultural NGOs, government programs, and possibly private agri-tech. As we mentioned earlier the core of the project is already completed so the required funding will be very minimum. And if we fail to collaborate with any external organizations the four of us will continue the project independently, as the required funding is very minimal and manageable on our own.

But there are other challenges that could affect the sustainability of the project. Technically, the model must stay accurate as new plant diseases emerge or existing ones evolve. This means we’ll need to continuously update our dataset and retrain the model, which requires reliable data collection and ongoing technical work. For that, we plan to use the data or images that users will capture through the app. Also, we are planning to directly teach them how to take clear and useful pictures which will help improve our dataset over time and make the model more accurate for real world conditions. With a strong focus on continuous improvement, partnerships, and user education, we believe the project can remain sustainable and impactful in the long run.