



Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology
Rajshahi-6204, Bangladesh.

Course No: CSE 4108

Course Name: Sessional based on CSE 4107

Final Report

**Information System Analysis and Design based on
Fruit Research Station, BARI, Rajshahi**

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Information System Analysis and Design

Fruit Research Station, BARI, Rajshahi

Overview:

A system is an organized relationship among the functioning components that are connected to achieve any specific objective. Here, we have analyzed the system of our proposed institution named the Fruit Research Station (FRS). The mission, vision, achievements, organizational hierarchy, etc. of FRS are firmly analyzed here. Basically, the system development life cycle indicates all the necessary units that are essential to achieve any successful system goal and tries to solve the limitations. In the very first chapter, recognition of need is discussed. It's a must which indicates the problems and limitations of the system. It elaborately discusses the shortcomings of our system to be perfect. Then in the second chapter, we have discussed the Initial Feasibility Study whose objective is to acquire a sense of its scope, not to solve the problem. Sequentially comes the third chapter, where the Information Gathering process is explained and different information-gathering tools are discussed such as the review of literature, procedures and forms, onsite observations, questionnaires and interviews. Through these terms, different necessary information is collected and also employees feedback and satisfaction in their job in FRS are known. In chapter four, we have explained that Structured Analysis is also important because it allows the system analyst to design system specifications that are easily comprehensive. This set of techniques follows some graphical tools like DFD (Data Flow Diagram), Data dictionary, Decision tree, Structured English, and Decision table. The data flow diagram is designed from which the data means inputs of the system flow and desired outputs are found being analyzed. FRS (Fruit Research Station) generally follows a DFD (Data Flow Diagram) which has some problems and so we proposed a better DFD for the betterment of their system as it is useful for requirements analysis, system design and communication between the employees. Structured English and the decision table for FRS (Fruit Research Station) are also discussed. Then comes chapter five, which elaborately explains the Feasibility Study which determines the problem definition and whether an alternative solution is feasible or not for the problem. However, it's an assessment of a proposed plan or project. Through the key considerations of economic feasibility, technical feasibility and behavioral feasibility this important part is done in our system in FRS. A feasibility study also identifies potential issues and problems that could arise during its implementation. Generally, it is a very important part that contributes to a project's success. In chapter six, we have discussed one of the most essential parts named Forms Design, which is necessary for data collection and interaction with the users. In FRS (Fruit Research Station), different types of forms are used for their working purposes which are perfectly designed according to the requirements. Effective form design is so crucial for the system as it is one of the most important ways to communicate between users and the systems. Lastly, in chapter seven, one of the most crucial parts of system analysis is Cost and Benefit Analysis which quantifies the costs and benefits of a proposed project and evaluates whether the project is efficient. Many types of costs and benefits are analyzed here through our system and some required steps are discussed to find out the proper costs and benefits of the system using various evaluation methods.

Chapter 1

Recognition of Need

1.1. Introduction

The Fruit Research Station (FRS) is an agricultural research institution that does the study and development of fruits. It is one of the several research stations operated by Bangladesh Agricultural Research Institute (BARI). The establishment of fruit research stations is typically driven by the need to enhance fruit production, improve the quality and yield of fruit crops. This institution plays an important role in conducting scientific research, developing new varieties, improving cultivation techniques and providing technical support to local farmers and the overall fruit industry.



Figure 1.1: Fruit Research Station, BARI, Rajshahi

1.2. Background History

BARI has a long historical background of its own. On the recommendation of the Famine Commission in 1880, the Bengal Department of Agriculture was established as a subordinate part of the Department of Land Records in the then Bengal. In 1908, an experimental station which has become known as Dhaka Farm was established on an area of 161.20 hectares of land. This Dhaka Farm was the predecessor of BARI and some other research institutes. Then gradually other institutes are established under BARI like FRS (Fruit Research Station) for better improvement. Basically, these stations were typically established by the government agricultural departments, agricultural research institutions.

1.3. Objectives of Fruit Research Station

The primary objectives of fruit research station include –

- 1. Variety Development:** Fruit Research Station aims to develop new and improved fruit varieties having improved nutrition, taste and disease resistance. So this involves cross-pollination, proper flowering, and hybridization to evaluate different genetic traits.
- 2. Disease and Pest Management:** Fruit Research Station focuses on studying and finding solutions for the various diseases, pests that affect the fruit crops and hampers the production. So, it works to find out the problems and tries to overcome the problems.
- 3. Crop Management:** This station conducts research on effective cultivation practices, crop nutrition, irrigation and also pest management to optimize the fruit production and quality for the betterment of the people.

1.4. Mission and Vision

Mission:

- Development of high-yielding, nutritious and tolerant varieties of crops
- Development of advanced, modern and sustainable production technology based on crops and determination of appropriate cropping patterns
- Development of eco-friendly crop preservation technology
- Accelerating agricultural mechanization through innovation and development of suitable agricultural machinery
- Conservation and improvement of soil health
- Accelerating agricultural mechanization through innovation and development of suitable agricultural machinery
- Develop suitable technologies to minimize post-harvest losses
- Socio-economic development of the country through the transfer of invented breeds and technologies
- Survey of crop market management

Vision:

Increasing production and productivity of crops and fruits under Bangladesh Agricultural Research Institute.

1.5. Services provided by FRS

- Providing fruit seedlings to the fruit farmers.
- Arranging workshops for the fruit farmers.
- If there is any new breed available which is better than the current one, providing that to the local farmers and educate them about its cultivation
- Supplying seeds and seedling to government and private agencies on government notice.
- Participating in agricultural fair to showcase their product.
- Provide suggestions regarding cultivation of any fruit to the farmers if they enquire.
- Conduct cross breeding between different breeds to get a highly efficient fruit.
- Checking nutrition factor of new fruits.
- Conducting research on manipulating the fruit gene in headquarters laboratory.

1.6. Location

The Fruit Research Station (FRS), BARI is located at Binodpur, Rajshahi, Bangladesh

Postal Code: 6206

Website link: <https://frs.rajshahidiv.gov.bd/en>

Google Maps Location:

<https://www.google.com/maps?ll=24.367377,88.656776&z=15&t=m&hl=en&gl=BD&mapclient=embed&cid=8219971882166021654>

1.7. Organizational Employees

The organizational hierarchy of Fruit Research Station, BARI, Binodpur, Rajshahi starts with a ‘Principal Scientific Officer’ under his supervision there are 5 officers. Two of them are ‘Senior Scientific Officer/Agricultural Engineer/Curator’ and the rest of the officers are ‘Scientific Officer’. Then under them there is a workforce of 19 staff members along with a ‘Senior Scientific Assistant’ and five ‘Scientific Assistant’(s). The staff also includes three ‘OACCO’, a ‘Tractor Driver’, a ‘Laboratory Attendant’, a ‘Preparer’, a couple of ‘Guards’, two ‘Office Assistant’, and three ‘Mali’. They all maintain their organizational hierarchy to implement any decision. Generally, this represents different roles, positions of all the workers and relations among the co-workers. It is very important to establish proper internal control, enhance transparency in the organization and ensure accurate financial reports. Overall it manages the organizational works properly and removes confusion among the workers to perform their responsibility perfectly.

1.8. Organizational Hierarchy

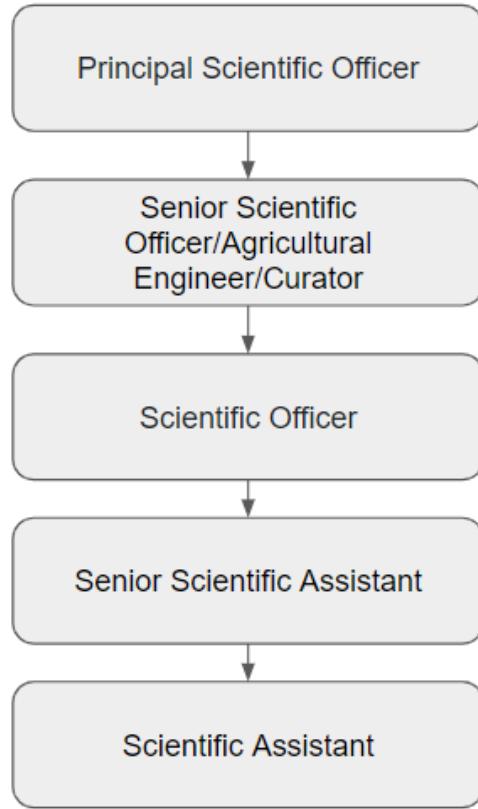


Figure 1.2: Hierarchical Structure of FRS¹

1.9. Problem Identification

The basis for a candidate system is recognition of the need for improving an information system or a procedure. This need leads to a preliminary survey or an initial investigation to determine whether an alternative system can solve the problem. If the problem is serious enough, management may want to have an analyst to look at it. The analyst prepares a statement specifying the scope and objective of the problem. The analyst also collects various information related to the problem and tries to figure out all the problems to achieve the respective objective of the organization. At last, he/she proposes a candidate system to solve the problems and reviews it with the user for accuracy.

1. Md. Abu Shahed (Scientific Officer, FRS, Rajshahi)

1.9.1. Lack of employees

It was observed that the organization has a shortage of employees. There are in total 19 employees in the Fruit Research Institute. But they have a wide range of tasks to complete. Collecting samples from the field, Hybridization, evaluating the result of the research, and providing important information about fruit cultivation to the farmer are the main services of the FRS. Because of the shortage of employees, the current employees have to face over workload which leads to delayed projects and slow progress. The researcher of the institute cannot perform their research activities properly.

1.9.2. Lack of digitalization of documents

The lack of digitalization of documents poses significant challenges and limitations to its operation and information management system. Time is crucial for a researcher. The employees store all the information in digital format as well as in a notebook. They have started this method in recent years. But the information of the previous year was not documented in a digital format yet. There is a high probability that some important data and documents are missing. Besides, it will take a lot of time to find specific information which decreases the organization's overall performance and effectiveness.

1.9.3. Not having own database

FRS is an agricultural organization under BARI (Bangladesh Agricultural Research Institute). BARI has their own data bank which stores all the research related data of its branch institute. FRS is one of them. When FRS completes any research or has to store any data, it sends all the data to the BARI and BARI store data. But FRS does not have their own database. And that's the reason why Fruit research station does not store their research related information and customer information freely.

1.9.4. Lack of information in website

After visiting the website of FRS, it was found that a lot of information is missing from the website or some information is not provided properly. There is no information about their recent research topics, achievements and what type of fruit they have invented. It also shows that some pages are blank. A person can find that some pages do not provide any information or redirect the previous page. Fruit cultivation technique, variety of new discovered fruit, nutritional value of fruit, fruit plants, this kind of information is missing from websites which leads to an ineffective website.

1.9.5. Not having any system analyst

A system analyst collects information about the system, tries to understand its components, functions and interaction to identify its strengths, weaknesses and opportunities. An analyst also

tries to figure out the system's problem and vulnerabilities. They gathered information about the organization's system and based on this information proposed an efficient and effective candidate system. After implementing this candidate system, the organization's performance can increase drastically. There are no system analysts posted in the FRS. But there are some agricultural officers who work as an information officer. But they can't use organization's information properly to optimize the system's performance and proposed a suitable candidate system. For further improvement of FRS and to use the organization's information properly, a system analyst is needed for the system.

1.9.6. Lack of online payment system

The payment system of the FRS (Fruit Research Station) is not online. This can result in delays, difficulties in tracking payments, and potential financial discrepancies. All the employees get their payment through offline. A customer wants to buy some fruit plants. But it's impossible for him to buy the plants without an online transaction method. But if the customer or any company wants to buy a lot of plants at a time, BARI has provided an online transaction method. The customer can complete the payment through Bkash or Nagad. But still there is no transaction method for FRS which leads the system to a slow and difficult transaction process.

1.9.7. Lack of instruments

There are not enough instruments to use in research. Their research facilities require high quality instruments that often come with high cost that can take a huge input. Because of the limitations in budget, FRS can't acquire all the necessary instruments that can bring them more exposure in work. They also lack integrated software to communicate with other areas related to these.

1.9.8. Inadequate research funding

They face a number of financial constraints in their research activities. As FRS is a specialized research facility within the Bangladesh Agricultural Research Institute (BARI), it has to depend on BARI financially. The budget that they get is not enough for their research activity. The government allocates specific funds for this station. The amount of the fund is not that satisfactory. Most of the time they adjust with it as much as they can.

1.9.9. Limited capacity for technology adoption

Adopting certain technologies may require the presence of supporting infrastructure, such as laboratory facilities, specialized equipment. Inadequate infrastructure can hinder the adoption and utilization of advanced technologies. Because of their limited financial support or investment, the lack of good laboratory facilities, and skilled people who can operate these technologies and maintain them. They do arrange training programs for the staff but not in enough amount as there is limited access to the training opportunities.

1.9.10. Lack of effective collaboration with farmers and local communities

Clear and accessible communication is essential to bring up collaboration and ensure that research findings are understood and implemented by the target audience such as farmers or entrepreneurs. As they do not have any integrated software to communicate, they stay behind in communicating with local communities. Because of only one exhibition in a year, they do not get enough opportunity to collaborate with farmers about their research findings. Lack of exhibitions caused lack of participation of farmers in their research program. As they have limitations in communication channels, they cannot always have a deep understanding of the local contexts.

1.10. Recruitment Process

Fruit Research Station is a governmental organization. So, all the recruitment process is arranged by the government. The recruitment process is completed by BARI (Bangladesh Agricultural Research Institute). All the applicant must have to complete his/her undergraduate studies which is the minimum requirement with agricultural background. BARI will arrange an exam for the applicant to get the job. After passing the exam, applicants can join FRS or the other respective organization.

1.11. Research Failure Analysis and Management

Agricultural research is a long process. Sometimes, it will take 5-6 years. For mango hybridization, it takes 9-10 years which is a long period. In this long time, there is a high risk that the project can fail. A lot of money and time is wasted for this failed research project. But in the research field, there is no term for failure. The researcher of the FRS collects all the information about the failed project and tries to find out where the problem is. At the same time, they document all the information about the project so that there are no problems in the near future. And again, repeat the research so that they can invent a new variety of fruit.

1.12. Achievements of FRS

Fruit Research Station, BARI, Binodpur, Rajshahi has some remarkable achievements in the field of inventing new breeds of fruits.

Till date they have successfully created 14 developed breeds of fruits of mango, litchi and star apple.

Mango Breeds:

- BARI MANGO - 14
- BARI MANGO -12
- BARI MANGO - 3
- BARI MANGO - 4
- BARI MANGO - 15
- BARI MANGO -16
- BARI MANGO -17

Litchi Breeds:

- BARI-1
- BARI -3
- BARI -4

Falsha Breeds:

- BARI FALSHA
- BARI FALSHA-1

Star Apple Breeds:

- BARI JAMRUL-2

They have achieved a few major national awards for their achievements. From those -

- “Bangabandhu National Agro Award” - 2012
- “Independence Award” – 2014, are the most mentioned.

1.13. Conclusion

In conclusion, the analysis of the Fruit Research Station (FRS), BARI reveals that they have expanded their scope to include other areas such as fruit processing, value addition, marketing research and overall maintaining nutrition. This concludes the introduction chapter. The main goal of this chapter was to introduce Fruit Research Station (FRS) and its mission, visions, objectives, problems, hierarchy and so on. In the following chapter, these problems and further topics will be discussed properly.

Chapter 2

Initial Feasibility Study

2.1. Introduction

The term initial feasibility study means a test of a system proposal according to its workability, impact on the organization, ability to meet user needs and effective use of resources. It focuses on 3 major questions -

1. What are the user's demonstrable needs and how does a candidate system meet them?
2. What resources are available for given candidate systems? Is the problem worth solving?
3. What is the likely impact of the candidate system on the organization? How well does it fit within the organization's master MIS (Management Information System) plan?

Each of these questions must be answered carefully. They revolve around investigation and evaluation of the problem, identification and description of candidate systems, specification of performance and the cost of each system and final selection of the best system.

2.2. Problem Identification

- Lack of employees
- Lack of digitalization of documents
- Not having own database
- Lack of information in website
- Not having any system analyst
- Lack of offline payment system
- Lack of instruments
- Inadequate research funding
- Limited capacity for technology adoption
- Lack of effective collaboration with farmers and local communities

2.3. Summary of Findings and Recommendation

2.3.1. Lack of employees

Though the fruit research station is an important governmental organization for fruit research and development, it has been observed that there is a significant shortage of employees at the station. Because of the shortage of employees, the organization is facing various challenges and it is hampering its operations. The researchers are facing an over workload which degrades the performance of the researcher. As a result, there is a decline in the quality of work. Besides, the organization is also unable to complete important tasks in a timely manner and the overall productivity of the station is being affected. So, to solve this problem -

- **Increase recruitment efforts:** BARI should prioritize the recruitment of qualified and skilled personnel specially for the Fruit Research Station. This can be done by job fairs and advertisements. Besides, the organization can collaborate with academic institutions specializing in agriculture.
- **Enhance incentives and benefits:** BARI should review and improve the incentives and benefits offered to employees at the fruit research station. This can include competitive salaries, career development opportunities and modern research labs.
- **Collaborations and partnerships:** BARI should collaborations and partnership with national and international agricultural research institutions. They can help the fruit research station to solve the crisis. Besides, these collaborations also involve the sharing the resources, expertise and research findings which will help the both parties

The lack of employees is hampering the productions and research activities of the organization. By solving the problem, the fruit research station can improve its productivity, conduct more effective research and contribute significantly to the development of the fruit industry.

2.3.2. Lack of digitalization of documents

The fruit research station is facing a lack of digitization of documents which is causing the inefficiencies and challenges in managing accessing valuable research data. The fruit research station plays a significant role in the fruit research and development activities. It has been observed that there is a significant lack of digitalization of documents at the FRS. In this modern time, they still store most of the information manually. They said that some data is stored in both physical and digital form which is very time consuming. Some previous research data is still not digitized. The absence of digitization hampers the efficient management and organization of documents. Besides, to find important information about the research is very time consuming and labor-intensive. It is very difficult to share information and valuable documents with another researcher.

- **Document scanning and digitization:** The organization should implement the Document scanning and digitization processes. This involves converting physical documents into digital formats, ensuring easy access, searchability, and preservation of valuable research data.
- **Implement a document management system:** A document management system can easily organize all the information of an organization. It can easily categorize and index the information. Retrieval of documents is easier for a DMS system.
- **Training and awareness programs:** Training and awareness programs are the most important for the employees of the FRS. In this way, this program will help the employees to understand the importance of digitalization of documents. They are also familiar with different document digitization software with the help of this program.

The FRS should prioritize document scanning and digitization, implement a document management system, and provide training programs to enhance digital literacy among employees. By embracing digitalization, the organization can access the research data easily and

share the research information with another collaborative organization to enhance the organization's overall performance.

2.3.3. Not having own database

The fruit research station does not have its own database which poses challenges in managing and organizing research data.

The fruit research station plays a vital role in the field of fruit research. It is a branch office under the Bangladesh Agriculture Research Institute. BARI has its own data bank. It has its own capacity and limitations. FRS sends its all-research data to the BARI and BARI stores the data in a data bank. FRS cannot store all the research data to the data bank to its own limitations. They only store important data. But if there is a database in the FRS, they can store all the research data freely and access the information without the permission and difficulties of upper authorities. Besides, accessing data, storing information, and creating a gene bank for the FRS will be done easily. Besides, it will also ensure data security.

- **Database development and implementation:** BARI should invest in developing a database for the FRS. It will include storing information, accessing information and deletion of the unwanted data.
- **Standardized data collection and entry:** The organization should prioritize the standard protocol for data collection and entry. This will ensure consistency in data format and quality.
- **Data security and backup:** There should be a robust security system in the database to protect the sensitive research data. Regular backups should be performed to prevent the data loss for any kind of system failure.

Because of the database system of FRS, the organization can easily store all the research information without any hesitation. This will also protect them from revealing any sensitive research information. And backup will prevent the data missing for any database/system failure.

2.3.4. Lack of information in website

The official website of Fruit Research Station, BARI, Binodpur, Rajshahi is <https://frs.rajshahidiv.gov.bd>. This website is registered under a subdomain of rajshahidiv.gov.bd. In this website we are only able to find location, officer and staff information. Even the organogram and communication page redirects to the home-page. So there is an adequate lack of data on their website. There is no mention about their ongoing project, their annual budget and turnover, their stock of different seedlings and seeds, or their achievements. There is also no photo gallery. The problem can occur due to a lack of technically sound employees who can update data to their website. Generally they first write their data in a notebook and then type it in the computer as a document and submit it to the head-quater. Instead of that an app or interactive website can be used to store findings and research. From there non-confidential data can be arranged and presented to the public in the website.

2.3.5. Not having any system analyst

There is no official system analyst in the institution. As per the interview with Scientific Officer Md. Abu Shahed the role of system analyst is played by the officers. If there arises a need for analysis of a system the Scientific Officers play that role alongside their usual duties. But in their view there is not such a need for a system analysis in their institution.

Lack of a system analyst can make the system inefficient. To overcome this lacking they need to hire a system analyst who is sound with technical and interpersonal skills to interact with the employee and officers. He or she can find a more efficient way the system can perform and increase productivity.

2.3.6. Lack of online payment system

In the interview with Scientific Officer Md. Abu Shahed, we came to know that various government and private agencies can buy seedlings or plants from Fruit Research Station, BARI, Binodpur, Rajshahi. For small quantities they have to come visit the institution and talk to the “Mali” about availability of the seedlings or plants. Then by contacting the officials they can make payment with cash and buy their seedlings.

But when the order is in large scale they have to put a request in BARI’s official website (<http://www.bari.gov.bd/>) from there they have to go to the bank and deposit the required amount of money to buy the product. Hence there is no fully online procedure or payment system for buying seedlings. This problem can be solved by launching their own website, showcasing their products and creating an online payment gateway. This can be done by giving contracts to private software/ web developer firms or hiring someone from a freelance marketplace to develop the website .

2.3.7. Lack of instruments

To address this problem FRS can collaborate with other institutions, can also seek external funding for their instruments and prioritizing instrument maintenance. They can optimize the utilization of available resources.

2.3.8. Inadequate research funding

FRS can explore opportunities to diversify their funding resources beyond government allocations. By seeking partnership with private sector organizations, international funding agencies and development banks, FRS can enhance their financial capability and have additional resources for their research activities.

2.3.9. Limited capacity for technology adoption

To cope up with this limitation FRS can focus on strengthening their financial resources, upgrading infrastructure, investing in training and collaborating with technology providers. Also

partnership with private sector entities, academic institutions and international organizations can increase knowledge transfer and technology adoption processes.

2.3.10. Lack of effective collaboration with farmers and local communities

To improve the system workings and achievements collaboration is a must . It is not only important for this system but also important for other systems as well. Effective collaboration with the farmers and the local communities can produce their ideas and opinions. So, the recommended part is -

- **Participatory Approach:**

A participatory approach that involves farmers and local communities can be arranged. Encourage their active participation in identifying challenges, setting research priorities and developing solutions. This approach also ensures that their perspectives, knowledge, involvement ,ideas and experiences are valued.

- **Knowledge sharing:**

Effective knowledge-sharing services or sessions should be established to bridge the gap between farmers, officers, researchers and local communities. Workshops, field demonstrations and training can help to disseminate research findings and innovate techniques.

- **Incentives and recognition:**

Provide incentives, recognition and rewards for farmers and local communities who actively participate in research activities and contribute to knowledge generation. This could include financial incentives, certificates, awards etc. Such initiatives will motivate and encourage them to build up the collaboration.

2.4. Conclusion

In this chapter named “Initial Feasibility Study”, some problems are discussed in this existing system. Actually the objective of a feasibility study is not to solve the problem but to acquire a sense of its scope. During the study, the problem definition is crystallized and aspects of the problem to be included in the system are determined. Consequently, costs and benefits are estimated with greater accuracy at this stage. So, a more in-depth analysis is important to remove these problems and identify the effective solutions for further improvement of this system.

Chapter 3

Information gathering

3.1. Introduction

For a complete understanding and study of the problems as well as analyzing the feasibility of a system, the main and first part is to collect all information about the system. For collecting information, information gathering tools are important. For collecting information, we arranged interviews. The information collection part was done in several phases like available information from their websites, documents and interviews with their employers and employees.

- Firstly, the company's mission, vision, and organizational structure was collected through their websites which help to get an overall idea of the running system of the Fruit Research Station (FRS).
- Secondly, information was collected from the employer and employees who run the system and are in the system. This part was done using interviews and questionnaires. This information helped us to get an overall idea of how the system is run, the work environment, authority-employee relationships, satisfaction and dissatisfaction, functionality of the system etc.
- Finally, information about the Fruit Research Station's whole system's workflow is needed. A data flow (DFD) diagram helps an analyst to analyze the data flow in the system through various points. So, a data flow diagram was built at the end to analyze the company's every aspect easily.

3.2. Information gathering tools

We have followed some specific process for information collection from the fruit research station. We visited the institution and observed the environment. Our team also visited their cultivation land to observe their ongoing research project. They also showed us new varieties of fruits that were invented by the fruit research station. The information was also collected from different online resources such as the FRS and BARI website. The institution also provided us with some documents, papers, books and forms from where we collected our necessary information. Our group also performed an interview with their scientific officer named Abu Shahed to collect information about their institution, research and future goal. We have also created a questionnaire form for collecting some individual information of the institution's employees. We have mainly followed these four types of processes for information collection. These processes are called information gathering tools. They are:

- Review of Literature, Procedures and Forms
- On-Site Observation
- Interviews
- Questionnaires

3.3. Review of Literature, Procedures and Forms

Our group reviewed various document papers obtained from both the FRS and the institution's official website. Through these documents, we gained valuable understanding about the budget allocation across different research sectors. Most of the information was collected from the recorded documents of the FRS and the BARI website. The document papers provided us with a comprehensive understanding of the financial distribution within the agricultural research sectors.

A copy of the budget is given below:

ক্রম নং	প্রকল্পের নাম (বাতুরায়নকলা)	জারির সংখ্যা	মুদ্রণ	(লক্ষ টাকায়)	
				১	২
১.	বাংলাদেশ তেলবীজ ও ভাল ফসলের গবেষণা ও উন্নয়ন (এলিল ২০১৮ - ডিসেম্বর ২০২১)	৭১,০০	১৯৬,০০	২৭৬,০০	
২.	ভাসমান বেড়ে সবজি ও মসলা চাষ গবেষণা, সম্প্রসারণ ও জনপ্রিয়কলা (বারি অংশ) (১ম সংস্থাপিত) (জুলাই, ২০১৭-জুন, ২০২১)	৬১৬,০০	০,০০	৬১৬,০০	
৩.	বাংলাদেশ শাক-সবজি, ফল ও পান ফসলের প্রোকারাকৃত ও রোগবানাই-ব্যবস্থাপনায় দৈনব্য বাস্তুচুরুশক তিথিক প্রযুক্তির উন্নয়ন ও সম্প্রসারণ (বারি অংশ) (আনুমতি ২০১৮-ডিসেম্বর ২০২১)	১৯৪,০০	১৮৮,০০	৩৮২,০০	
৪.	বাংলাদেশ মসলা জাতীয় ফসলের গবেষণা জোরাবরণকল (১ম সংস্থাপিত) (অক্টোবর, ২০১৭ - জুন, ২০২১)	৮৬৮,০০	১৪৭৭,০০	২৩৫৫,০০	
৫.	গোপালগঞ্জ মেলায় বিদ্যুতাবাহী এবং কৃষি গবেষণা কেন্দ্র স্থাপন ও দেশের মধ্যে পরিচালনের পরিবেশ-প্রতিবেশ উপযোগী গবেষণা কার্যকলার জোরাবরকরণের মাধ্যমে কৃষির উন্নয়ন প্রকল্প (১ম সংস্থাপিত) (জুলাই, ২০১৮ - জুন, ২০২১)	৬০০,০০	১৫৮৪,০০	২১৮৪,০০	
৬.	সহানুভাব একাডেমিকারাম কার্যকলারিদেশ প্রজেক্ট (এসএসিপি) (বারি অংশ) (জুলাই ২০১৮- জুন ২০২১)	১৯৯,০০	০,০০	১৯৯,০০	
৭.	আকলিক উন্নয়নকল গবেষণা কেন্দ্র কৃষিয়াকে আকলিক কৃষি গবেষণা কেন্দ্র উন্নয়নকল প্রকল্প (১ম সংস্থাপিত) (জুলাই, ২০১৮- জুন, ২০২১)	১৭৪,০০	৮০১,০০	৯৭৫,০০	
৮.	কৃষি ব্যবস্থা ও লাগান প্রযুক্তি উন্নয়নের মাধ্যমে ফসল উৎপাদন ব্যবস্থাকে অধিকার লাভজনক করা (জুলাই ২০২০- জুন ২০২১)	২৭০,০০	৬৭৮,০০	৯৪৮,০০	
৯.	তেলজাতীয় ফসলের জুলাদন কৃষি প্রকল্প (বারি অংশ) (জুলাই, ২০২০-জুন, ২০২১)	২৭৫,০০	২৩০,০০	৫০৫,০০	
১০.	কৃষি গোলান সংস্থান এবং বাংলাদেশের সেব নির্ভর কৃষি ব্যবস্থার মক্ষতা ও উৎপাদনশীলতা বৃদ্ধিকরণ শীর্ষক সমীক্ষা প্রকল্প (জুলাই, ২০২০-জুন, ২০২১)	১০২,০০	০,০০	১০২,০০	
১১.	কান্তুবাদাম ও কার্ফি গবেষণা, উন্নয়ন ও সম্প্রসারণ (বারি অংশ) (আনুমতি ২০১৮-ডিসেম্বর ২০২১)	২৯৫,০০	৪৬৫,০০	৭৫৬,০০	
১২.	আকলিক ভাল গবেষণা কেন্দ্র ব্যবস্থাপনার সম্পর্ক কৃষি এবং বৃক্ষের ব্যবস্থা, ফরিদপুর অঞ্চলে ভাল ফসলের উৎপাদন কৃষি (জুলাই ২০২০- জুন ২০২১)	২৩২,০০	০,০০	২৩২,০০	
	সর্বমোট:	১৯০৬,০০	১৮৯৪,০০	৯৮০০,০০	



ড. মোঃ মুশ্বী রাসীদ আকতুল্লাহ
প্রতিবেশ কর্তৃপক্ষ
পরিচালনা ও মুদ্রণ বিভাগ
বাংলাদেশ কৃষি সংস্কার ইনসিটিউট
বাংলাদেশ সরকার প্রতীক্ষা-১৭০১



ড. মুশ্বী রাসীদ আকতুল্লাহ
প্রতিবেশ কর্তৃপক্ষ
পরিচালনা ও মুদ্রণ বিভাগ
বাংলাদেশ কৃষি সংস্কার ইনসিটিউট
বাংলাদেশ সরকার প্রতীক্ষা-১৭০১

Figure 3.1: Allocation of annual development budget in 2021-22¹

1. Website - <http://www.bari.gov.bd/site/page/>



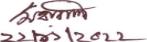
বাংলাদেশ কৃষি গবেষণা ইনসিটিউট
অর্থ ও হিসাব শাখা
গাজীপুর-১৭০১।

Phone : ৪৯২৭০০৩০
E-mail: baribudget@yahoo.com
Web : www.bari.gov.bd

২০২১-২০২২ অর্থ বছরে বাংলাদেশ কৃষি গবেষণা ইনসিটিউট এর রাজস্ব খাতে বরাদ্দকৃত অর্থ।

(লেক টাকায়)

ক্রমিক নং	অর্থ বছর	মোট বাজেট বরাদ্দ	বেতন-ভাত্তা বাবদ প্রাপ্ত বাজেট	পণ্য ও সেবার ব্যবহার বাবদ প্রাপ্ত বাজেট	পেনশন অবসর সুবিধা বাবদ প্রাপ্ত বাজেট	মুলধন ও অন্যান্য বাবদ প্রাপ্ত বাজেট	মন্তব্য
১।	২০২১-২০২২	৩০২৭৫.৪২	১৬০৯৫.৩৪	১১০৩৭.২৮	২৭০০.৮০	৪৪২.০০	


 মো. মোড়াল আব্দুল সালাম
কৃষি বিজ্ঞান অধ্যাপক-জন্ম
অর্থ ও হিসাব শাখা
বাংলাদেশ কৃষি গবেষণা ইনসিটিউট
গাজীপুর, বাংলাদেশ
২২/১২/২২


 মোড়াল আব্দুল সালাম
কৃষি বিজ্ঞান অধ্যাপক-জন্ম
অর্থ ও হিসাব শাখা
বাংলাদেশ কৃষি গবেষণা ইনসিটিউট
গাজীপুর, বাংলাদেশ
২২/১২/২২

Figure 3.2: Allocation of total development budget of BARI in 2021-2022²

All the new varieties of fruits are listed in a documented list which were invented by the FRS. There are also listed the cultivation method of the specific fruit which is very helpful for the farmer. Our team also understands the importance of the local fruit for their nutrition. At present, FRS focuses on different kinds of local fruit. As a result, Falsha was invented. Over the years, FRS has focused on increasing the quantity of a specific fruit as well as the amount of nutrition in a fruit. Here are some new varieties of fruit which was invented by the FRS:



Figure 3.3: BARI MANGO-11³

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2. Website - <http://www.bari.gov.bd/site/page/>
 3. Innovative Agricultural Technology 2015-2015

জলপাইয়ের জাত

বাংলাদেশ কৃষি গবেষণা ইনসিটিউট বারি জলপাই-১ নামে একটি জাত উদ্ভাবন করেছে, এর প্রধান প্রধান বৈশিষ্ট্য হল-

বারি জলপাই-১

উচ্চ ফলনশীল নিয়মিত ফলদানকারী জাত। গাছ মধ্যম আকৃতির, ছড়ানো ও কিছুটা বোপালো। কার্তিক মাসের শেষার্থ থেকে পৌষ মাসের প্রথম ভাগ পর্যন্ত ফল আহরণ করা যায়। ফল তুলনামূলকভাবে বড় (গড় ওজন ৪৬.৩৩ গ্রাম), পাকা ফলের রং হালকা সবুজ, শিস সাদা, এবং মধ্যম টক (ব্রিচামান ৬.২০%)। বীজ খুব ছেট, খাদ্যাপযোগী অংশ ৮৪.৯৯%। বাংলাদেশের সব এলাকায় চাষযোগ্য। গাছপ্রতি ১৯০০-২০০০টি ফল ধরে যার গড় ওজন ১২৫ কেজি।



Figure 3.4: BARI Olive-1, a new variety of olive invented by FRS⁴

১৪.	বারি বাতাবিলেৰু - ৫	১০.০৩	-	<ul style="list-style-type: none"> গাছটির পাতা তুলনামূলকভাবে অনেক বড় ও বোপালো। ফল দেখতে উজ্জল হলুদ বর্ণের। ফল সাধারণত এককভাবে ধরে।
১৫.	বারি পেয়ারা - ৮	৩০-৩৫	-	<ul style="list-style-type: none"> উচ্চ ফলনশীল, বীজবিহীন অমৌসুমী জাত। পরিপক্ব ফলের রং হলুদাভ সবুজ। প্রতিটি ফলের গড় ওজন ২৮৪ গ্রাম।
১৬.	বারি জামরঞ্জ-৩	৬.৬	-	<ul style="list-style-type: none"> এটি উচ্চ ফলনশীল জাত। পরিপক্ব ফলের রং আকর্ষণীয় লালচে খয়েরী। ফল ঘন্টাকৃতি, ফলের শাঁস আটশাটে, সাদা, কচকচে ও খেতে খুবই মিষ্টি।

Figure 3.5: 3 new varieties of fruits invented by FRS⁵

From the documents detailing the newly invented fruit varieties by the Fruit Research Station, we were able to learn about their nutritional content, taste, size, and cultivation methods. With this information readily available, farmers can easily access and learn about these new fruit varieties, enabling them to cultivate them successfully. Additionally, the documents provide insights into the optimal growing conditions and potential challenges associated with each variety, further assisting farmers in making informed decisions.

4. Innovative Agricultural Technology 2014-2015

5. Md. Abu Shahed (Scientific Officer, FRS, Rajshahi)

We have also studied different forms of Fruit Research Station and try to understand the pros and cons of the forms. Different kinds of forms are used by the FRS for security purposes. Sometimes, a customer uses a form to buy plants. Here, some researchers will use this kind of form to get the germplasm from the FRS.

REQUEST FORM FOR GERMPLASM

The Director General
 Bangladesh Agricultural Research Institute
 Joydebpur, Gazipur-1701
 BANGLADESH
 Email: dg.bari@bari.gov.bd Fax No.: +88-02-9261415

Attention: Chief Scientific Officer, Plant Genetic Resources Centre, BARI
 Tel. No. 88-02-9294083 Email: drmahossain1959@yahoo.com

The following germplasm are needed for research purposes:

Name of crop: _____

Scientific name: _____

No. of accessions needed: _____

Accession number: _____

I intend to utilize the germplasm in breeding program/characterization/detailed evaluation for biotic or abiotic stresses or any other study (please specify): _____

Location of experiment: _____

Terms and conditions:

- Hard and soft copy of genetic information of the supplied germplasm with original BD accession number assigned by PGRC should be provided.
- Original BD accession number assigned by PGRC should not be changed.
- PGRC must be acknowledged if any technology is developed from PGRC materials.

I shall abide by the above terms and conditions as specified by the PGRC of BARI.

Signature: _____

Name of applicant: _____

Designation/Status: _____

Memo No.: _____ Date: _____

Recommended by _____

Signature: _____

Name : _____

Designation: _____

Address: _____

Figure 3.5: Request form for Germplasm⁶

After observing the above form, we can conclude that no one can obtain the germplasm without permission from the FRS. If any researcher from FRS or BARI wishes to study a specific fruit and requires its germplasm, they must submit an application for the germplasm.

6. Website-<http://www.bari.gov.bd/site/page/f5d327e5-4af4-4c5f-98c350d24210b59c/AllForm>

3.4. On-Site Observation

After visiting the FRS, we were amazed. At first, we observed that they are so friendly. The employees helped us a lot to collect all the necessary information. Our team visited all the previously invented varieties of fruits by FRS. We also knew about their ongoing research projects. At present, they are conducting research on different foreign fruit like dragon fruit as well as different kinds of foreign mango varieties. We witnessed all their tasks and learned a lot about their cultivation method.

3.5. Interviews

3.5.1. Interview with Scientific Officer

Name: Md. Abu Shahed (Scientific Officer, FRS, Rajshahi)

1. **Question:** How many scientists are working for FRS?
Answer: In the Fruit Research Station, BARI there are actually 5 scientific officers. Among them the designations are Principal Scientific Officer, Senior Scientific Officer/Agricultural Engineer/Curator and Scientific Officer.
2. **Question:** How can a person buy different kinds of plants from FRS?
Answer: To purchase different kinds of plants from the Fruit Research Station (FRS) firstly should contact them. This may involve searching online, visiting their official website if available or contacting via phone, email with the relevant agricultural or research authorities to obtain the necessary details. Then provide details about the specific types of plants that a person is interested in purchasing. Once one has all the necessary information can place an order and ask FRS for information regarding the pricing of the plants, packaging, shipping or handling fees and gets a smooth delivery or collection process.
3. **Question:** How can a farmer get their necessary information from FRS?
Answer: First of all, farmers should determine the specific information which can be related to crop cultivation techniques, pest management, plant varieties, disease control, fertilizer recommendations etc. Then they can contact the FRS authority through phone, email, in-person visit. They can also use the hotline number to ask for help. On the other hand, Fruit Research Station also has guidelines related to books, training sessions, brochures or other materials to provide enough information to the farmers and help them as much as possible.
4. **Question:** How much time do you need to complete research?
Answer: In Fruit Research Station, there are some research projects which are designed to address specific questions or problems that can be completed within a few months. These projects often involve smaller-scale experiments, data collection and analysis focused on a particular aspect of fruit production, pest management or crop improvement.

Other research at FRS may require a longer period like developing new fruit varieties, crossbreeding, evaluating them etc.

5. **Question:** Can you talk about some variety of fruit that FRS has invented?

Answer: Since inception, Fruit Research Station has been successfully contributing agricultural production by evolving technologies that are suitable for the country's climate and appropriate for the farmer's condition. Some varieties of fruits are like BARI MANGO-14, BARI MANGO-12, BARI FALSHA, BARI FALSHA-1, BARI JAMRUL-2, some litchi breeds like BARI-1, BARI-3 etc.

6. **Question:** We know that Falsha is a local fruit. What kind of information motivates FRS to research on this fruit?

Answer: Falsha is a local fruit and as we all know it has great nutrition values. Furthermore, the kind of Falsha local farmers used to cultivate before are not high yielding. Thus, invention of more efficient breeds was necessary to make it economically profitable, tasty, disease resistant and nutritious fruit. We also want to introduce our local fruit to the international market.

7. **Question:** How can a farmer know about your new invented fruit variety?

Answer: We organize workshops for local farmers. Collaborate with farmers associations to educate about new findings. Every year we participate in "Krishi Mela" to showcase our new varieties of crops and fruits.

8. **Question:** What kind of technology do you use to store research data?

Answer: We generally write the data in our record book. Then this data, whichever is necessary for the national database, is sent to BARI via the web to store in their database. So, our database is still not digital.

9. **Question:** What kind of topic does FRS focus on for fruit research?

Answer: We focus on making the fruit more disease resistant, high yielding, more nutritious, tasty and more appealing by looks.

10. **Question:** What is your strategy to deal with internal conflicts among the team members?

Answer: As our organization is small with a few officers and few workers and there is a chain of order. Thus, situations that can cause conflict do not really happen. If such a situation occurs, we can always contact higher authorities or FRS and BARI.

11. **Question:** What is the recruitment policy for Scientists?

Answer: As FRS is an autonomous body, the recruitment process is done by BARI itself. The recruitment process and policies are set by the institution or relevant government authorities. When there is a need to fill scientific positions, the research institution typically issues a job announcement according to which they check eligibility criteria. Afterwards shortlisted candidates chosen by the application process are interviewed and

evaluated. The selection committee makes recommendations based on the candidates' performance. The candidate must have an undergraduate degree in agriculture.

12. Question: What is the office working hour?

Answer: Generally, research institutions and offices in Bangladesh follow a standard working schedule. We follow the same schedule. The typical office working hours are Sunday to Thursday from 10:00 am to 5:00 pm. 1:00 pm to 2 pm is our lunch break.

13. Question: How many weekends does FRS have?

Answer: FRS have the same number of weekends as the BARI have. Twice in a week, Saturday and Friday.

14. Question: How do you handle under-performing team members?

Answer: Once under-performance is identified, we have an open and honest conversation with the team member. We try to find out the reason behind it. If the under-performance is due to a lack of skills or knowledge, we provide training and development opportunities. This involves workshops, mentoring, coaching, or assigning a person to support their growth. If efforts to improve performance are consistently unsuccessful, we use alternatives such as reassignment to a different role.

15. Question: How Do You Motivate People to Stay on Track and Meet Their Deadlines?

Answer: We clear the significance of meeting deadlines and how it contributes to the success of research projects. That would include highlighting the impact that timely completion of tasks has on the agricultural sector and the potential benefits it brings. Encourage employees to share their progress, challenges, and ideas. We offer assistance and resources when needed. We clear instructions and guidelines for each task so that it gets easier for them to stay on track. Most importantly we recognize their efforts through verbal praise, written commendations, or other forms of recognition within the FRS.

16. Question: What are the steps to consider when your project is off track?

Answer: At first, we try to find out the root causes and then adjust the project plan. Transparently communicate with project stakeholders, including team members. If needed we reallocate the resources. Then we implement corrective actions so that the project doesn't go off track. For further progress we learn from experience.

17. Question: What are the potential benefits and drawbacks of introducing new technologies at the Bangladesh Fruit Institute?

Answer: Potential benefit would be a lot like it would enhance productivity by automating processes. New technologies can provide researchers at FRS with advanced tools and equipment to conduct experiments, collect data, and analyze results. This can enhance the accuracy, precision, and reliability of research findings, leading to more robust scientific outcomes. Largely it can improve data management systems, allowing for better organization, storage, retrieval, and analysis of research data. Adopting new

technologies can provide FRS with a competitive edge in the field of fruit research. Drawbacks can't be ignored as we are very much limited in budget. Introducing new technologies often involves significant investment in infrastructure, equipment, software, and training. The initial costs, as well as ongoing maintenance and upgrades, can strain financial resources needed to assess the financial feasibility and long-term sustainability of adopting new technologies. It may pose challenges related to compatibility with existing systems or integration with established workflows. It may face resistance from employees who may be accustomed to traditional methods or skeptical about change.

18. Question: Is there any chance for higher studies after joining FRS?

Answer: Yes, we can provide opportunities for individuals to pursue higher studies. We also encourage and support the professional development of their staff members, including pursuing advanced degrees and higher studies. They can apply for higher studies till the last day of their job.

19. Question: If a person damages the plant of FRS, what kind of punishment does he/she get?

Answer: If a person damages the plant of FRS or even steals any fruit then he/she will be punished with 3 months of jail and 1 lakh taka as penalty.

20. Question: Is there any opportunity for an intern?

Answer: For graduates, there are not really any opportunities for internships in our station. But any agricultural background student can join our institution through a circular which is conducted by the BARI.

21. Question: Does FRS allow a scientist within the institution to express his/her idea?

Answer: Yes, we do. Scientists are 100% allowed to express their thoughts and ideas. They are fully independent to do their job according to their and the institution's needs. Nobody is allowed to hinder or stop their work in any way.

22. Question: How does FRS introduce new technology between its employees?

Answer: Generally, this includes a combination of training programs, workshops, hands-on demonstrations, and knowledge-sharing initiatives. Our goal is to ensure that employees are aware of and proficient in utilizing the latest technologies relevant to their work.

23. Question: We know that fruit research is a long process. If there is failure after a long process, what kind of steps do you take?

Answer: Basically, we keep learning while doing any research project. It is a continuous process and never ending. So, when the result is not as what we expected, we learn from it and complete it, then we approach a different way to do the research again. So technically we don't really call it a failure. We introduce different approaches to keep it going.

24. Question: If there is any shortage of budget. How does FRS manage that?

Answer: Though most of the time the budget is short, we try to do our best within the issued budget. We prioritize research areas based on their potential impact, alignment with national priorities, and relevance to the needs of farmers and the agricultural sector. By focusing resources on high-priority research, the FRS can allocate its limited budget to areas that offer the greatest potential for positive outcomes.

3.6. Questionnaires

We created a set of questions for the employees of FRS to understand their mindset. Our team developed 16 forms to collect information from the employees, with each form containing approximately 9 questions. Through these questions, we were able to understand the satisfaction level of the employees. It was observed that most of the higher-ranking employees expressed satisfaction with their jobs. However, there were some individuals who expressed less satisfaction with their current positions. Based on the feedback received from the employees, our team has gained some valuable insights. We also understand what improvements can be made for enhancing job satisfaction.

1. **Question:** Are you satisfied with your salary?

Options:

- 1. Not Satisfied
- 2. Less Satisfied
- 3. May be Satisfied
- 4. Satisfied
- 5. Very Satisfied



Figure 3.6: Employee's satisfaction about their salary

Most of the employees are satisfied with their salary. But there are still some employees who are less satisfied with their salary. Some high-ranking employees are very satisfied with their salary. Besides scientists, there are also some employees who don't get that much money. So, the institution should focus on increasing the salary of the worker to increase the satisfaction level.

2. **Question:** Are you satisfied with the budget?

Options:

- 1. Not Satisfied
- 2. Less Satisfied
- 3. May be Satisfied
- 4. Satisfied
- 5. Very Satisfied

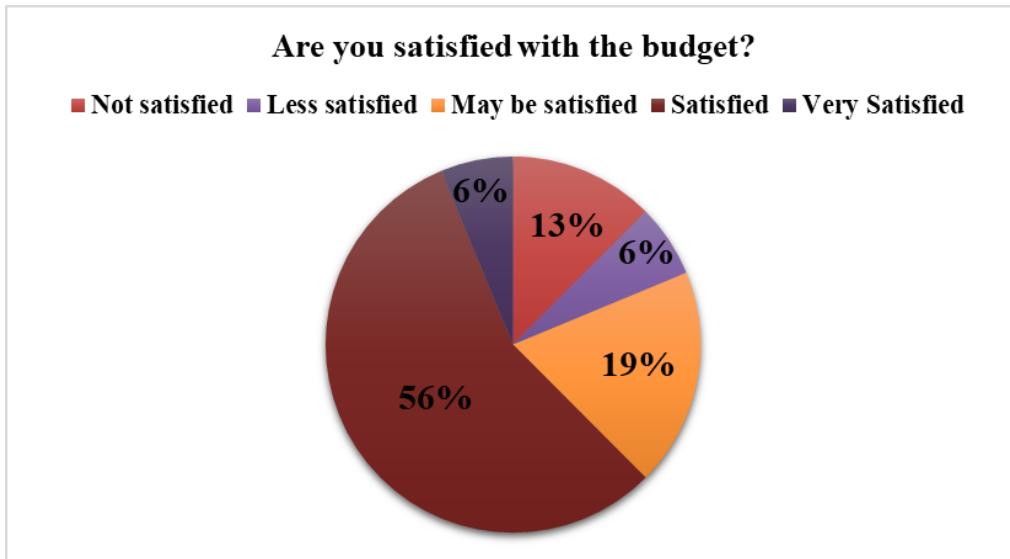


Figure 3.7: Employee's satisfaction about the budget

Most of them are satisfied with the budget. Some people are very satisfied with the amount. But still, there are some people who are satisfied with the budget. This can occur because of the increasing price of research equipment.

3. **Question:** How much are you satisfied with your team members?

Options:

- 1. Not Satisfied
- 2. Less Satisfied
- 3. May be Satisfied
- 4. Satisfied
- 5. Very Satisfied

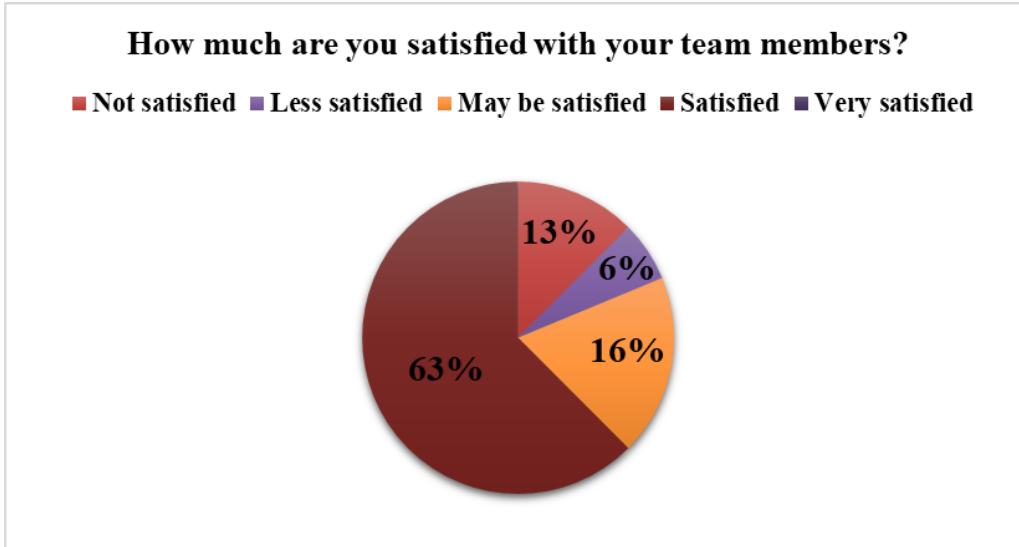


Figure 3.8: Employee's satisfaction about their team members

Most of them are satisfied with their team-mates. Some of them are less satisfied and not satisfied also. Lack of communication can be the main reason for this dissatisfaction.

4. Question: How much are you satisfied with the research facility?

Options:

- 1. Not Satisfied
- 2. Less Satisfied
- 3. May be Satisfied
- 4. Satisfied
- 5. Very Satisfied

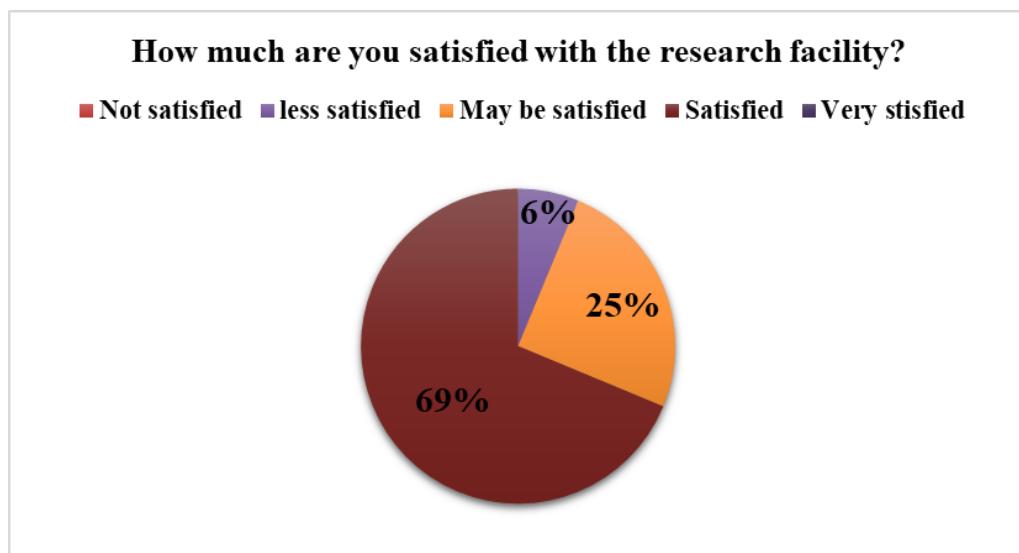


Figure 3.9: Employee's satisfaction for research facility

Most of the employees of the fruit research station are satisfied with the research facility. On the other hand, a small number of people are still less satisfied. FRS should invest in developing their research facility so that the employees can conduct their research and experiment with full satisfaction.

5. Question: Are you satisfied with your working environment?

Options:

- 1. Not Satisfied
- 2. Less Satisfied
- 3. May be Satisfied
- 4. Satisfied
- 5. Very Satisfied

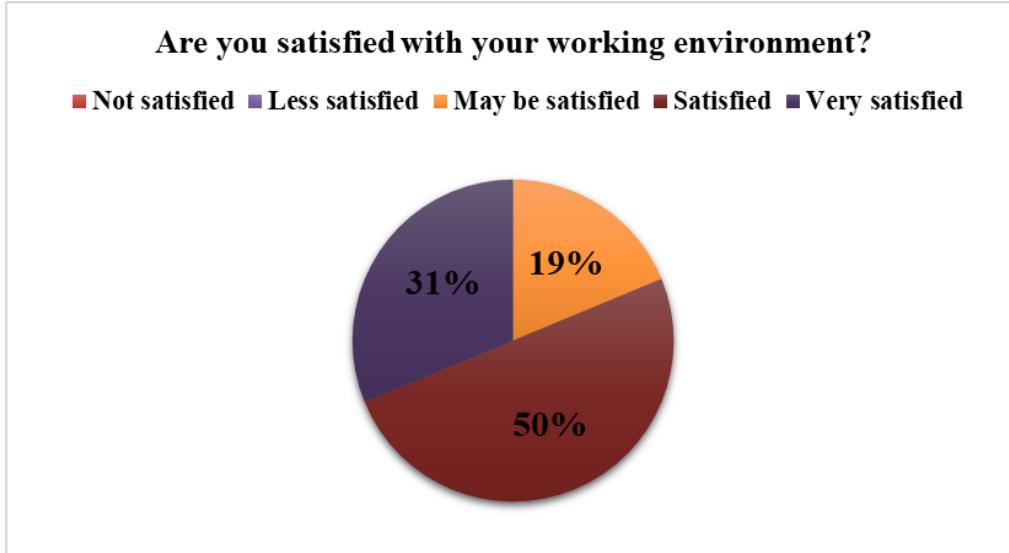


Figure 3.10: Employee's satisfaction with their working environment

50% of people are satisfied with their working environment. Some people did not express their full satisfaction. But some employees are very satisfied with their working environment. It is about 31%. So, in total, 81% of employees have expressed their full satisfaction.

6. Question: Are you satisfied with your working hours?

Options:

- 1. Not Satisfied
- 2. Less Satisfied
- 3. May be Satisfied
- 4. Satisfied
- 5. Very Satisfied

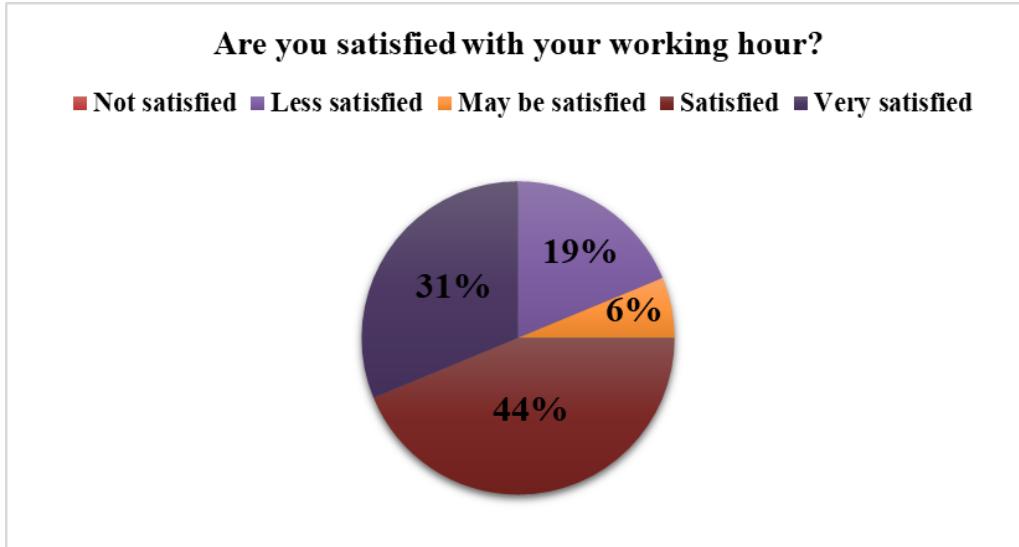


Figure 3.11: Employee's satisfaction about their working hour

Most of the people are satisfied and very satisfied with their working hours. It is about 75%.

7. **Question:** Are you satisfied with the access to resources in FRS and BARI?

Options:

- 1. Not Satisfied
- 2. Less Satisfied
- 3. Not mention
- 4. Satisfied
- 5. Very Satisfied

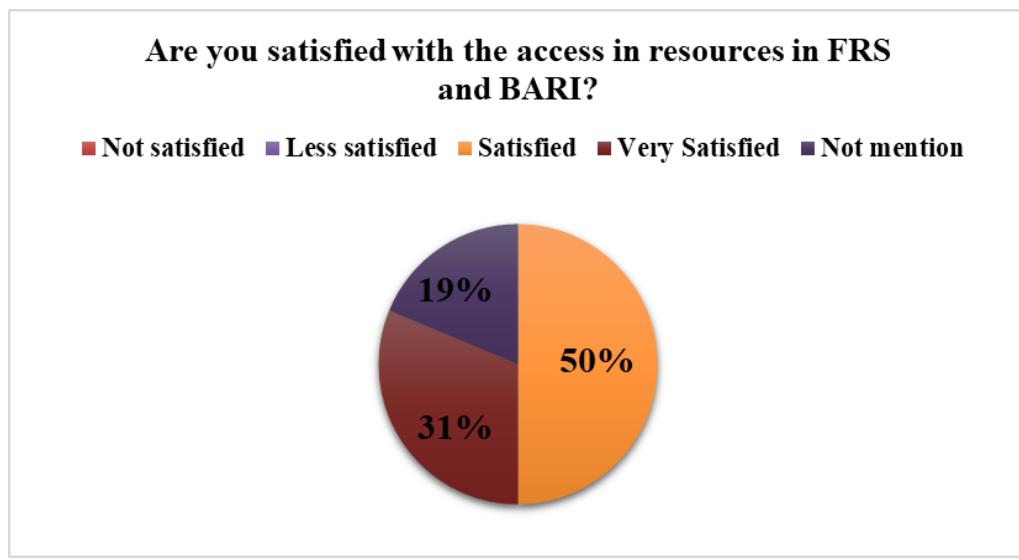


Figure 3.12: Employee's satisfaction for accessing the resources of FRS and BARI

Most of the employees are satisfied with the access to resources of FRS and BARI. Half of the employees of our surveys are satisfied with the access of the resources. Some of the employees are very satisfied with the FRS and BARI. Mainly, they are the researchers of the fruit research station. Some employees like the gardeners, security guards, office assistants do not get access to the resources of the institution.

8. Question: Can you express your idea about specific research?

Options:

- 1. Yes
- 2. No
- 3. Sometimes

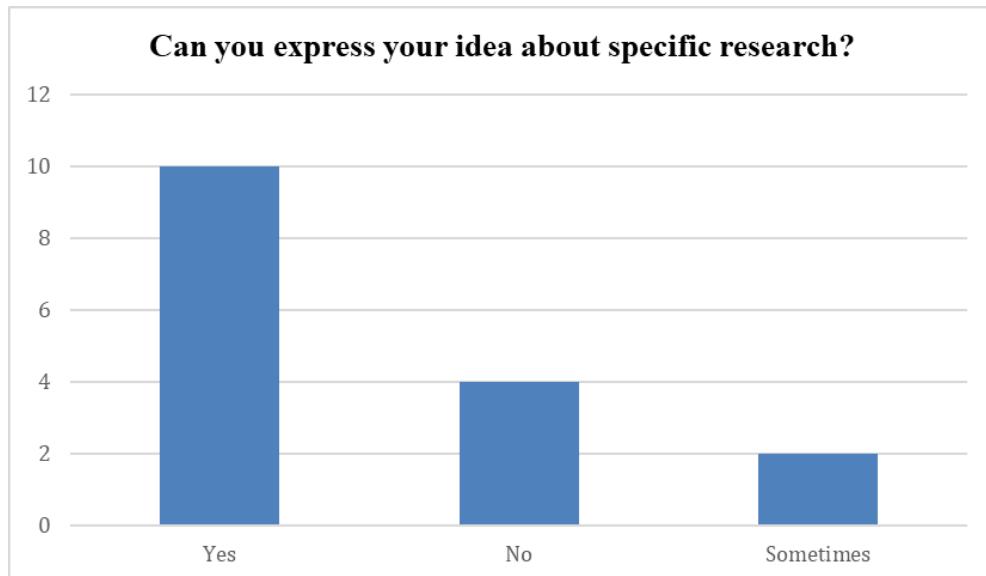


Figure 3.13: Employee's survey for expressing their ideas

Most of the employees of FRS can express their ideas or can make suitable decisions in a critical moment. They are mainly the researchers of the institute. The researchers are independent. They can research and experiment on their own ideas. Some of the people like office assistants, security guards and the gardeners can't express their ideas.

9. Question: How do you train yourself with new technologies?

Options:

- 1. Helped by advisor
- 2. Self-learning
- 3. Helped by team-members and senior employees
- 4. Participating in a workshop arranged by BARI

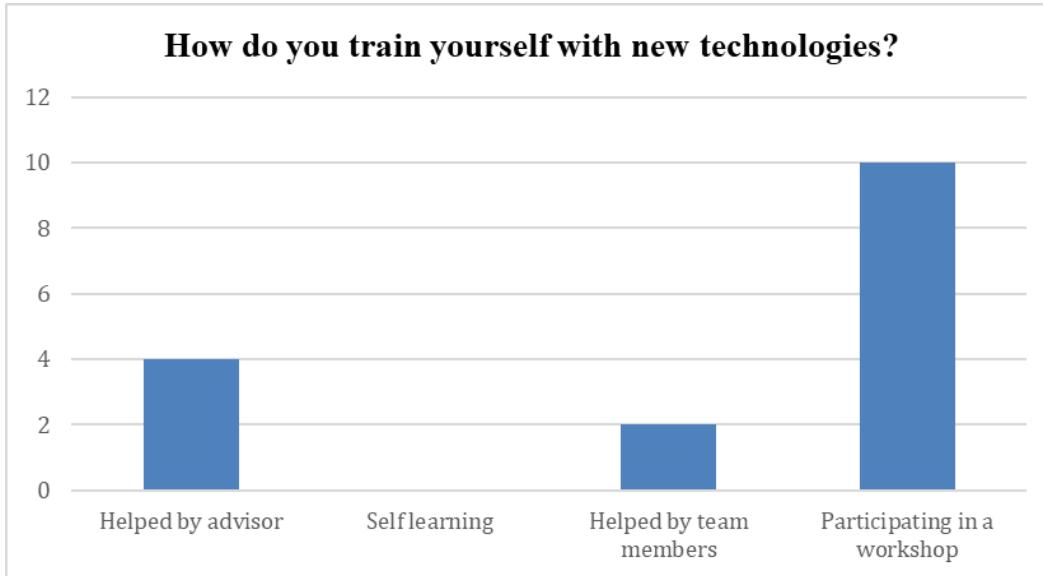


Figure 3.14: Employee's survey for training themselves with new technology

BARI organizes a workshop for their employees so that they can introduce themselves with new technology. Most of the employees follow these ways. Some take from the advisor. Also, researchers train themselves by helping each other.

3.7. Conclusion:

For understanding the authority-employee relationships and analyzing the system's problem, information gathering tools and questionnaires methods are important and helpful. Here, through an interview, we can see that in our system, which means the Fruit Research Station (FRS), most of the employees are satisfied with accessing resources and information as they can easily access them and find their answers and solutions through them.

Information Gathered From: Md. Abu Shahed (Scientific Officer, FRS, Rajshahi)

BARI Website: <http://www.bari.gov.bd/>

FRS Website: <https://frs.rajshahidiv.gov.bd/en>

Chapter 4

The Tools of Structured Analysis

4.1. Introduction

In today's data-driven world, extracting and analyzing data from institutions and information systems is crucial for informed decision-making and process optimization. This chapter explores various structured analysis tools, including Data Flow Diagram, Decision Tree, Decision Table, Structured English and Data Dictionary that facilitate the extraction and analysis of valuable data. The main goal of the structured analysis is to analyze and break down a system into smaller, manageable parts, facilitating a better understanding of its functional components. To achieve this goal, it relies on a set of tools and techniques that helps analysts to organize information and model system components. In FRS (Fruit Research Station) we also followed these tools properly to make the process organized and systematic. Throughout this chapter, we will delve into these structured analysis tools, where professionals can gain insights, make evidence-based decisions and optimize organizational processes. This approach promotes a systematic and organized way of designing and maintaining large-scale systems, ultimately leading to more successful projects.

4.2. Various tools of structured analysis

Structured analysis is a software engineering technique to analyze, design and document complex systems. Various tools and techniques are employed to achieve this goal. Some of the key tools include:

- **Data Flow Diagram (DFD):** It visually represents the flow of data within a system, providing insights into system boundaries and potential areas for improvement. It represents the processes that transform input data into output data and data stores where information is temporarily or permanently held. DFDs use various symbols to illustrate these elements.
- **Data Dictionary:** It is a repository that contains detailed definitions of all the data elements used in the system.
- **Decision Tree:** Decision Trees assist in decision-making by mapping potential outcomes and options, considering probabilities for effective decision making.
- **Structured English:** It is a way to represent the steps and procedures of a system's functionality. The purpose of using it to bridge the gap between the natural language used in the system and the formal representation used in analysis and design of the system.
- **Decision Table:** Decision Tables offer a structured approach to analyze complex business rules, simplify decision-making processes.

4.3. Existing Data Flow Diagram of the Fruit Research Station

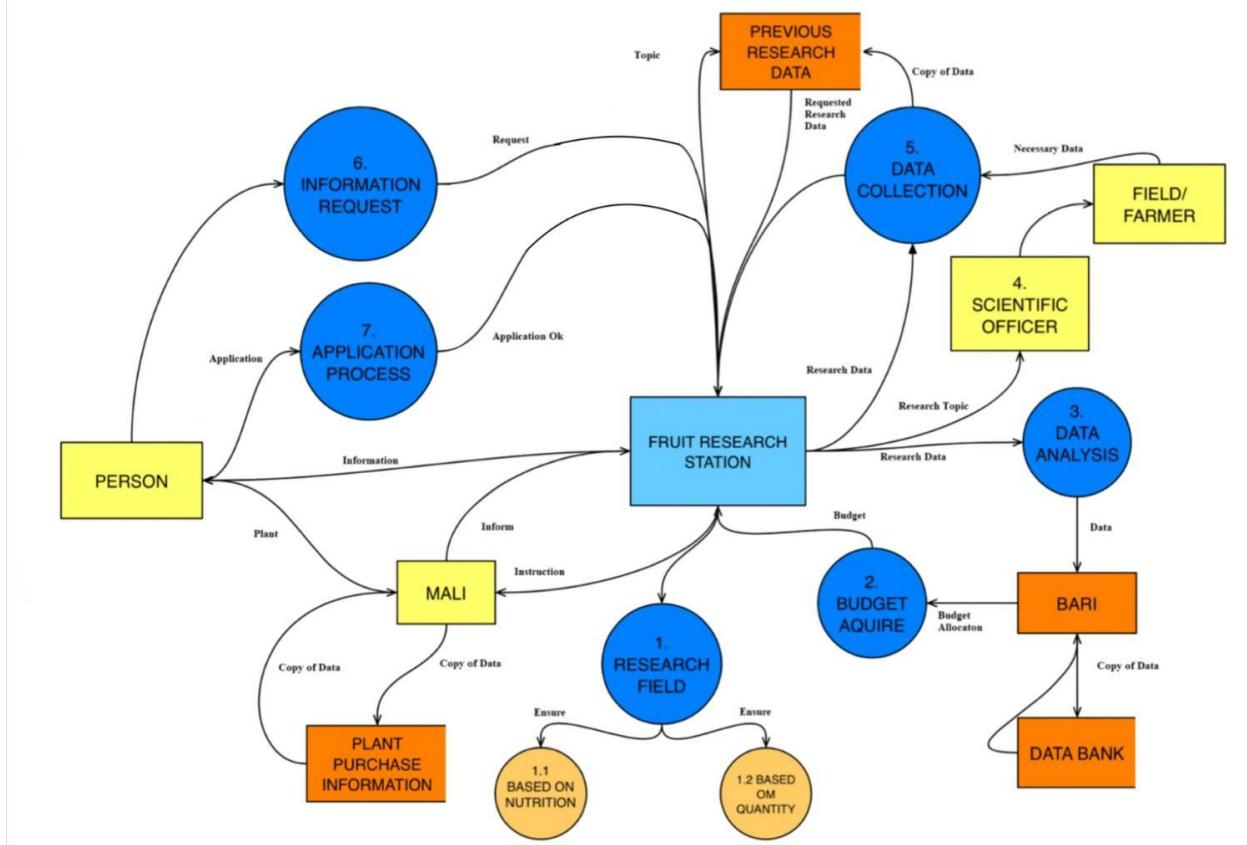


Figure 4.1: Data Flow Diagram of FRS¹

In the data flow diagram of the fruit research station, our team understood that anybody can purchase a new variety of fruit's plant from the FRS. At first, the person will communicate with an employee of the organization. The employee will speak with the gardener to provide the plants. By applying, he can easily get his preferred plants. The gardener will store all the information of plant purchasing. Besides, a farmer can easily get information about fruit cultivation by simply communicating with the FRS. Mainly, the fruit research station conducts research based on nutrition or based on the quantity of a fruit. At first, the researchers will collect all the research related data from the previous documents or from the farmer or field. Then, the team of the researchers will analyze the data and necessary information will be stored in a data bank via BARI so that the data can be used by other researchers in future. At last, a budget will be proposed by the FRS to conduct the experiment to the BARI. After acquiring the budget, the team will continue their research to discover new varieties of fruit. Fruit research stations contribute a lot in the fruit industry by inventing new varieties of fruits.

1. Md. Abu Shahed (Scientific Officer, FRS, Rajshahi)

4.4. Proposed Data Flow Diagram

A key issue in the DFD is the lack of complete online availability for all processes within the organization. To overcome this limitation, the proposal suggests upgrading the system into a fully online platform. This transformation would enable remote access to research information, allowing farmers to purchase new fruit varieties without the need for physical contact or long-distance travel. Moreover, people would have convenient access to fruit cultivation-related information online, contributing to the digitization of the fruit research industry. The transition to a fully online system would not only enhance data accessibility and real-time updates for researchers but also streamline communication and collaboration among different teams, leading to more efficient and coordinated research efforts. Additionally, it would promote interactive engagement with farmers and consumers, facilitating a customer-centric approach to fruit research and development.

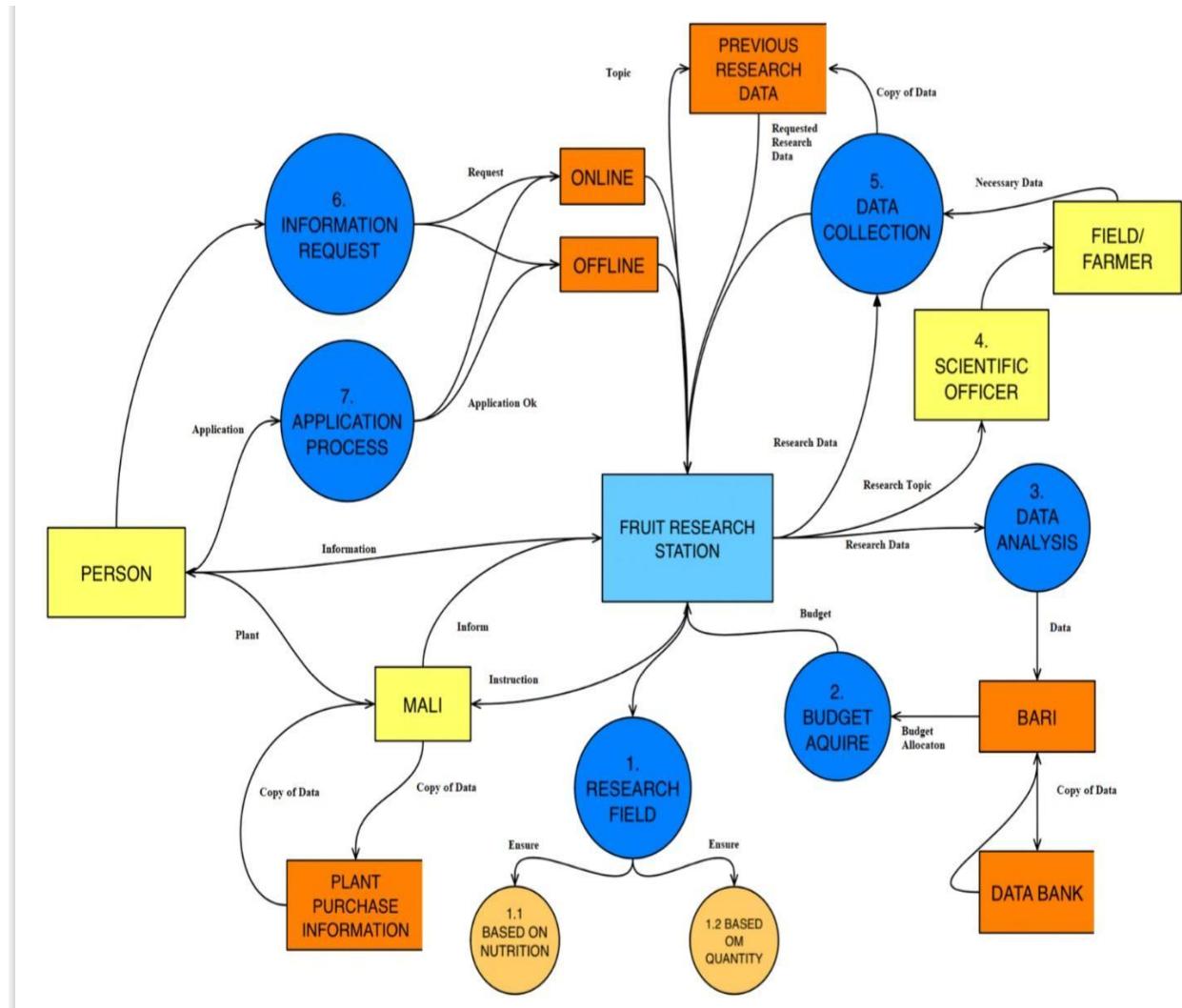


Figure 4.2: Proposed Data Flow Diagram of FRS

4.5. Decision Tree

Below is the decision tree for each type of research fruit, along with their respective research type and approximate time taken to complete the research:

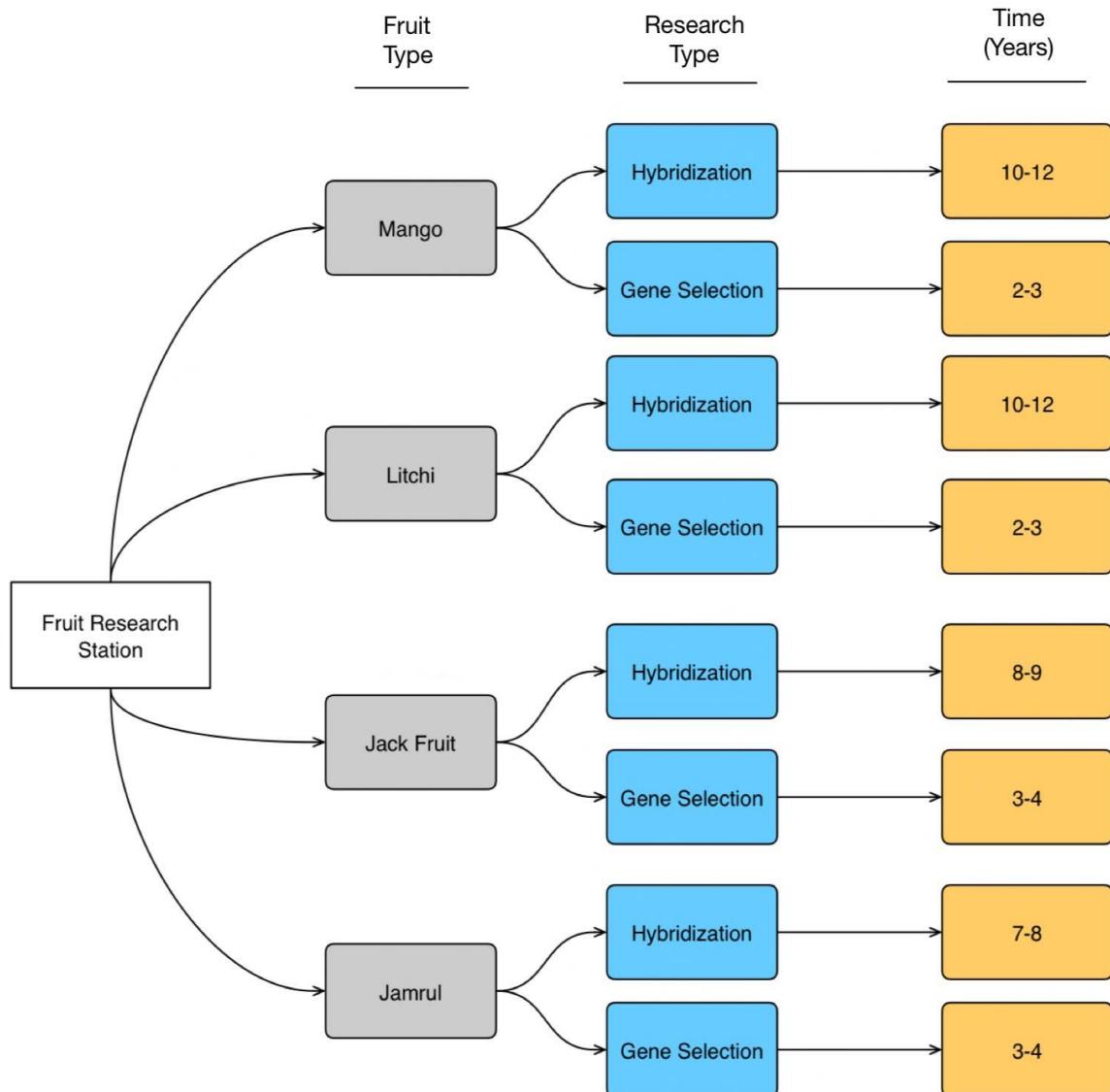


Figure 4.3: Decision Tree of the Fruit Research Station

4.6. Structured English

Below is a structured English representation, presenting various research fruit types, along with their corresponding research methodologies and estimated time frames for inventing new varieties:

IF the fruit type is Mango

and-IF the research type is hybridization,

THEN: the expected time to complete the research is 10-12 years.

ELSE IF the research type is gene selection,

THEN: the expected time to complete the research is 2-3 years.

IF the fruit type is Litchi

and-IF the research type is hybridization,

THEN: the expected time to complete the research is 10-12 years.

ELSE IF the research type is gene selection,

THEN: the expected time to complete the research is 2-3 years.

IF the fruit type is Jack Fruit

and-IF the research type is hybridization,

THEN: the expected time to complete the research is 8-9 years.

ELSE IF the research type is gene selection,

THEN: the expected time to complete the research is 3-4 years.

IF the fruit type is Jamrul

and-IF the research type is hybridization,

THEN: the expected time to complete the research is 7-8 years.

ELSE IF the research type is gene selection,

THEN: the expected time to complete the research is 3-4 years.

4.7. Decision Table

Displayed below is a decision table encompassing various research fruit types, alongside their corresponding research categories and approximate time frames needed to accomplish the research. The decision table comprises two phases: IF (condition) and THEN (ACTION). Once the rules in the first phase are matched, the data can be inferred to proceed to the second phase.

Table 4.1: Decision Table of the Fruit Research Station

IF (Condition)	The fruit type is Mango	Y	Y	N	N	N	N	N	N
	The fruit type is Litchi	N	N	Y	Y	N	N	N	N
	The fruit type is Jackfruit	N	N	N	N	Y	Y	N	N
	The fruit type is Jamrul	N	N	N	N	N	N	Y	Y
	The research type is hybridization	Y	N	Y	N	Y	N	Y	N
THEN (Action)	The research type is gene selection	Y	Y	Y	Y	Y	Y	Y	Y
	Expected time is 2-3 years		X		X		X		X
	Expected time is 3-4 years					X			
	Expected time is 8-9 years							X	
	Expected time is 7-8 years								X
	Expected time is 10-12 years	X		X					

4.8. Conclusion

Understanding the data flow within an organization is important for analyzing and designing an efficient system. By realizing the Data Flow Diagram (DFD) of the Fruit Research Station, we were able to comprehend the information and data flow within the organization. This valuable understanding helps a system analyst in designing a new, more effective system. Upon analyzing the DFD of the fruit research station, we identified a key issue: the absence of an online plant purchase system. Consequently, our team embarked on creating a new DFD that incorporates both online and offline systems, aiming to overcome this identified problem.

Chapter 5

Feasibility Study

5.1. Introduction

A feasibility study evaluates a system proposal based on its ability to work, influence on the organization, ability to meet user needs, and effective use of resources. The goal of a feasibility study is not to solve the problem, but to gain an understanding of its extent. The problem definition is determined during the feasibility study. It decides whether an alternative solution is feasible. In this chapter, we present a preliminary feasibility assessment of a candidate system according to our visited institution, Fruit Research Station (FRS), and conduct a feasibility study to see if the system will work perfectly.

5.2. Feasibility Considerations

A feasibility study is an assessment of the practicality of a proposed plan or project. It analyzes the viability of the project to determine its likelihood of success and is also designed to identify potential issues and problems that could arise during its pursuit. When undertaking a feasibility study, various factors are examined to assess whether the project is feasible and worth pursuing. These considerations, which typically include three key aspects, are essential components of a thorough feasibility study. The three key considerations for a feasibility study are:

- Economic Feasibility
- Technical Feasibility
- Behavioral Feasibility

5.2.1. Economic Feasibility

The economic feasibility of the FRS would depend on various factors including its funding, operating costs, research outcomes and the benefits it provides to the agricultural sector and the economy as a whole. It can be measured by the impact of its research on the agricultural sector. Successful research outcomes lead to improved crop yields, pest and disease management, post-harvest techniques and better agricultural practices can have a positive economic impact by enhancing productivity and increasing income for farmers. The institution's ability to achieve its research goals within allocated budgets and efficiently use resources contributes to its economic feasibility.

5.2.2. Technical Feasibility

Technical feasibility depends on the availability and adequacy of research infrastructure and facilities. This includes laboratories, experimental fields, storage facilities and equipment necessary to conduct fruit research effectively. As their research does not include the need of

higher-level equipment, it can be said that they have technical feasibility. They don't have enough data analysis tools, data analysts and remote sensing. So, they lack this side. It can increase their technical feasibility by having the ability to adopt these new technologies and having a qualified & diverse team of scientists.

5.2.3. Behavioral Feasibility

Behavioral feasibility depends on how well the institution's research activities align with human behaviors, attitudes and interactions of its stakeholders. FRS effectively engages and collaborates with various stakeholders including researchers, farmers, policy makers and local communities. They arrange exhibitions for their researched items so that innovations can reach the farmers and locals. They accept the technologies that the farmers can adopt and work with. They provide training and capacity-building programs to ensure that farmers and stakeholders can implement research-based recommendations. They also provide instant help and support by giving knowledge or solution of any problem related to fruit asked by a farmer. So, FRS has behavioral feasibility as needed.

5.3. Potential Candidate System

Our team has proposed two potential candidate systems. The first candidate system is designed based on a document store in a database in digital format. Additionally, it aims to upgrade the entire FRS (Fruit Research Station) system to an online format, enabling customers to access help easily online. This digital transformation is expected to enhance efficiency, accessibility, and user experience, making it a promising option for the fruit research station's future operations. On the other hand, the second candidate system is designed to enhance the knowledge of researchers, research facilities, and the research area. Its primary objective is to aid the fruit research institute in inventing new varieties of fruits. By providing advanced tools and data analytics, this system aims to facilitate cutting-edge research and foster innovation in fruit cultivation and development. The implementation of this candidate system could significantly elevate the institute's capabilities and contribute to groundbreaking advancements in the fruit industry.

5.4. Characteristics of Candidate System 1

Candidate system 1 mainly focuses on upgrading the FRS system into an online system. The characteristics of candidate system1 are:

- Establishing a centralized database
- Mobile application development
- Organize online Agri-Tech training Workshops
- Online fruit advisory services

5.4.1. Establishing a centralized database

As FRS doesn't have any integrated repository or database in the candidate system, establishing a centralized database is suggested. Consequently, all the relevant data, information and research findings can be stored and managed in a unified manner. It is way better and safe than collecting information in an analog way. Centralized database helps to maintain data integrity by eliminating the risk of multiple versions of the same data. It provides a solid foundation for data analytics and advanced research analysis. Staff and researchers can have easy access to the same data and information.

5.4.2. Mobile application development

Mobile application development can offer many types of benefits such as data collection, communication with farmers, information sharing about research findings and agricultural advisory services. Mobile applications can integrate with remote sensing technologies and IoT devices to monitor environmental conditions, soil moisture, temperature and other relevant parameters remotely. This can help farmers and researchers to identify pests and diseases in crops and provide recommendations to control it.

5.4.3. Organize online Agri-Tech training Workshops

Online workshop will allow FRS to reach a wider audience including farmers, students and researchers from different locations. Participants can join the workshop from the comfort of their homes or workplaces, making training more accessible. It will be cost-effective compared to traditional in-person workshops. It reduces expenses related to venue rental, travel and accommodations for participants and trainers. FRS can cover a wide range of Agri-tech topics in online workshops.

5.4.4. Online fruit advisory services

Online fruit advisory services will allow fruit growers and farmers to seek advice and guidance at their convenience. They can access the advisory services from their homes, farms or mobile devices, making it easier for them to get timely support. It can incorporate visual resources such as images, videos and infographics to illustrate disease symptoms and techniques. It can also provide interactive features such as chat support. The online platform can be designed to personalized recommendation based on specific fruit varieties, geographical locations and prevailing weather conditions.

5.5. Characteristics of Candidate System 2

Candidate system 2 is primarily designed to enhance the research-related knowledge and skills of the employees at the Fruit Research Station. The key characteristics of candidate system 2 are:

- Collaboration with foreign fruit research centers

- Training employees with new technologies
- Forming partnerships with agricultural universities

5.5.1. Collaboration with foreign fruit research centers

Fruit Research Station, Binodpur, Rajshahi works as a standalone organization that researches about fruits in Rajshahi District. As we know Rajshahi is not an industrial district rather it is an agricultural one thus fruit production has a great impact in its economy. FRS can expand its research by taking help from foreign fruit research centers who have weather conditions like ours such as Indian or Chinese fruit research centers. They are more technologically advanced in this field and this can be really a helpful collaboration for FRS, Rajshahi. Collaboration between fruit research centers can help in a number of ways, it can help to:

- Share information and resources, such as data, tools, and expertise.
- Coordinate research efforts, so that research is more efficient and effective.
- Develop new fruit varieties that are more resistant to pests and diseases, have better flavor and nutritional value, and are easier to grow.
- Promote the use of sustainable fruit production practices.
- Educate the public about the importance of fruit in a healthy diet.

Overall, collaboration with foreign fruit research centers can help to improve the quality, availability, and sustainability of fruit for everyone.

5.5.2. Training employees with new technologies

New technologies like being familiar with usage of modern equipment to study about fruit can be bought from foreign countries. But they will not give output as expected if the employees using it are not sound using it. Thus, a proper training session should be arranged for new technologies. FRS, Rajshahi does not maintain digital procedures for data entry and reports the employees should be trained to be familiar with computer and web technology to be more efficient. Moreover, new technologies can help FRS, Rajsahhi to improve in the following areas:

- Research methods and processes: New technologies can be used to collect and analyze data more efficiently, which can lead to better research outcomes.
- Product and service development: New technologies can be used to develop new products and services that are more appealing to customers.
- Operations: New technologies can be used to automate tasks, which can lead to more efficient operations.
- Employee attraction and retention: New technologies can be used to attract and retain top talent, which can lead to a more productive workforce.

Overall, training employees with new technologies can help improve their performance in all areas.

5.5.3. Forming partnerships with agricultural universities

FRS, Rajshahi can benefit from forming a partnership with agricultural universities in a number of ways.

Firstly, the partnership can provide the research center with access to a wider range of expertise and resources. Agricultural universities have a wealth of knowledge and experience in areas such as plant breeding, pest management, and soil science, which can be invaluable to fruit research. Additionally, agricultural universities often have access to state-of-the-art facilities and equipment that can be used for fruit research.

Secondly, the partnership can help to promote the fruit research center's work. Agricultural universities have a large network of contacts in the agricultural community, which can help to raise awareness of the fruit research center's work and attract funding and support. Additionally, agricultural universities can help to disseminate the results of fruit research to farmers and other stakeholders.

Finally, the partnership can help to train the next generation of fruit researchers. Agricultural universities offer a variety of courses and programs in fruit science, which can provide the fruit research center with a steady stream of qualified employees. Additionally, the partnership can provide opportunities for fruit research center staff to collaborate with and learn from agricultural university faculty and students.

Overall, forming a partnership with an agricultural university can be a valuable way for a fruit research center to improve its research, promote its work, and train the next generation of fruit researchers.

5.6. Evaluate performance and cost effectiveness

The feasibility of our proposed candidate systems is analyzed by evaluating their performance in relation to their cost.

Performance:

1. Growth Potential
2. Farmer Engagement
3. Research Output
4. Long term impact
5. Knowledge and skills transfer

Cost:

1. Technology and infrastructure
2. Research materials and supplies
3. Employee Training
4. Data management and storage
5. Maintenance and Repairs

6. Office space

Table 5.1: Candidate System Qualitative Evaluation Matrix

Evaluation Criteria	Candidate System 1	Candidate System 2
Performance: <ul style="list-style-type: none"> 1. Growth Potential 2. Farmer Engagement 3. Research Output 4. Long term impact 5. Knowledge and skills transfer 	Very Good Excellent Good Very Good Excellent	Excellent Fair Very Good Very Good Excellent
Cost: <ul style="list-style-type: none"> 1. Technology and infrastructure 2. Research materials and supplies 3. Employee Training 4. Data management and storage 5. Maintenance and Repairs 6. Office space 	Good Excellent Excellent Good Very Good Very Good	Poor Fair Fair Good Good Fair

5.7. Weight system performance and cost data

The evaluation terms with their respective values for assessing the performance in relation to their cost of candidate systems are as follows:

- Poor (1)
- Fair (2)
- Good (3)
- Very Good (4)
- Excellent (5)

Table 5.2: Weighted Candidate System Evaluation Matrix

Evaluation Criteria	Weighting Factor	Candidate System 1		Candidate System 2	
		Rating	Score	Rating	Score
Performance: <ul style="list-style-type: none"> 1. Growth Potential 2. Farmer Engagement 3. Research Output 4. Long term impact 5. Knowledge and skills transfer 					
1. Growth Potential	3	4	12	5	15
2. Farmer Engagement	4	5	20	2	8
3. Research Output	5	3	15	4	20
4. Long term impact	4	4	16	4	16
5. Knowledge and skills transfer	4	5	20	5	20

Cost:					
1. Technology and infrastructure	4	3	12	1	4
2. Research materials and supplies	3	5	15	2	6
3. Employee training	5	5	25	2	10
4. Data management and storage	5	3	15	3	15
5. Maintenance and Repairs	4	4	16	3	12
6. Office space	4	4	16	2	8
		Total Score = 182		Total Score = 134	

5.8. Select the best candidate system

The candidate system with the highest total score, which in our case is candidate system 1 with a score of 182, is considered the best system in our feasibility study. In contrast, candidate system 2 obtained a total score of 134. Therefore, the fruit research station should select candidate system 1 as it has been identified as the best choice based on the evaluation.

5.9. Conclusion

The feasibility study concludes with a summary of findings and recommendations, providing a clear "go" or "no-go" decision for any project. It equips decision-makers with crucial information to weigh the pros and cons, make informed choices, and minimize risks while pursuing opportunities. Ultimately, a well-executed feasibility study is a valuable tool that can significantly contribute to the success of a project or investment. In our institution, we also maintained this idea of a feasibility study to determine whether the recommendations were perfect or not.

Chapter 6

Forms Design

6.1. Introduction

Forms are an essential part of user interfaces that facilitate data collection, interaction, and communication between users and systems. They are used in a variety of industries and processes, such as surveys, registration, feedback collection, and data entry. Effective form design is crucial for creating a user-friendly experience, maximizing completion rates, reducing errors, and ensuring the collected data is accurate and valuable. Designing forms involves creating structured documents or web interfaces that collect information from users efficiently and effectively. A well-designed form can significantly impact user satisfaction and the overall success of the intended process. Design a form should be relevant and must have specific context and audience for which it is needed actually. Understanding the users mentality and their needs is essential for creating a form that should be user-friendly and effective in achieving the goals.

Here are some tips for effective form design:

- Keep the form simple and concise.
- Use clear and concise language.
- Use appropriate formatting and layout.
- Use error checking and validation.
- Test the form with users.

By following these tips, you can create forms that are easy to use and provide valuable data.

6.2. Forms Used in Fruit Research Station

In the fruit research station, efficient management of research-related activities is ensured through the use of several essential forms. These forms are meticulously designed to expedite and streamline processes, making them invaluable tools for researchers and administrators alike. They also aid in maintaining accurate records, ensuring transparency, and encouraging a collaborative environment within the research station. Five main forms used in fruit research station are:

- Request form for germplasm
- Nomination Form for Bangabandhu National Agriculture Award
- Request for Innovation Idea Form
- Application form to get information
- Appeal Application

6.2.1. Request Form for Germplasm

This particular application form is used for collecting germplasm from the FRS, and it plays a crucial role in facilitating the preservation and enrichment of valuable plant genetic resources.

REQUEST FORM FOR GERMPLASM

The Director General
Bangladesh Agricultural Research Institute
Joydebpur, Gazipur-1701
BANGLADESH
Email: dg_bari@bari.gov.bd Fax No.: +88-02-9261415

Attention: Chief Scientific Officer, Plant Genetic Resources Centre, BARI
Tel. No. 88-02-9294083 Email: drmahossain1959@yahoo.com

The following germplasm are needed for research purposes:

Name of crop: _____

Scientific name: _____

No. of accessions needed: _____

Accession number: _____

I intend to utilize the germplasm in breeding program/characterization/detailed evaluation for biotic or abiotic stresses or any other study (please specify):-----

Location of experiment: -----

Terms and conditions:

- Hard and soft copy of genetic information of the supplied germplasm with original BD accession number assigned by PGRC should be provided.
- Original BD accession number assigned by PGRC should not be changed.
- PGRC must be acknowledged if any technology is developed from PGRC materials.

I shall abide by the above terms and conditions as specified by the PGRC of BARI.

Signature: -----

Name of applicant: -----

Designation/Status: -----

Memo No.: ----- Date: -----

Recommended by

Signature: -----

Name : -----

Designation: -----

Address: -----

Contact

Dr. M A Malek
Principal Scientific Officer
PGRC, BARI
Gazipur-1701.
Mobile: 01712178568

Figure 6.1: Request Form for Germplasm¹

Suggestions: The above form is an application for requesting germplasm. As a form, it lacks a few attributes. For example, there are no footnotes explaining the descriptions of the form's content. Additionally, some abbreviations are used without their full forms being mentioned, such as BD, BARI, and PGRC. These things can be fixed to provide a better experience for the candidate.

1. Md. Abu Shahed (Scientific Officer, FRS, Rajshahi)

Here are some specific suggestions for how to improve the form:

- Add footnotes to explain the descriptions of the form's content.
- Provide full forms for all abbreviations used in the form.
- Make sure that the form is easy to read and understand.
- Test the form with a few people to make sure that it is clear and easy to use.

By making these changes, the form will be more user-friendly and provide a better experience for the candidate.

6.2.2. Nomination Form for Bangabandhu National Agriculture Award

This form is the nomination for the prestigious Bangabandhu National Agriculture Award, recognizing outstanding contributions and achievements in agriculture. It allows individuals and organizations to submit nominations, showcasing innovations and promoting excellence in the industry.

‘বঙ্গবন্ধু জাতীয় কৃষি পুরস্কার’ – এর ভাষ্য মন্দোন্দৰন বচন
(টাইপ করে বক্সে পূরণ করতে হবে, এবং ক্লিক করলে অভিযন্তা কাশল যথব্যত করা যাবে।
ক্লিকের পরেও ক্লিক করলেই চলবে)।

১।	পুরস্কারের ক্ষেত্র	যদি
২।	মনোনীত ব্যক্তি/অভিযন্তা সম্পর্কিত তথ্যাবলী ৪	
ক. কৃষক		
(কৃষি বক্সেতে ক্লিক করলে উৎপাদন, শাক-সবজি, মুগ ও ফলের দায়, পরালিশও ও হাঁস-বুজি পালন, মুক খানার, বস্ত্র তাপ এবং কৃষি সম্পাদ উদ্যোগে নিয়োজিত কার্যক্রমে)।		
(১)	মনোনীত ব্যক্তির শাব্দ	
(২)	পিতৃর/বাচীর শাব্দ	
(৩)	মাতৃর শাব্দ	
(৪)	ঠিকানা ৪ থানা	আকর্ষণ
উপজেলা		জেলা
(৫)	বজ্রন	
(৬)	ঢেশশা ৪	
(৭)	কৃষকের অক্ষতি ৪- নিজ মালিকানা/ পতে/বর্ণালার	
খ. গবেষণা/ সম্প্রসারণ/ কৃষি উন্নয়নে সিল নির্দেশনা/ প্রক্রান্তিনা/ পানি ব্যবস্থাপনা/কৃষি শিক্ষা/ কৃষি প্রযোজনাকরণ/ কৃষি রক্তান্তি কাজে কর্মরত ব্যক্তি/ অভিযন্তা		
(১)	মনোনীত ব্যক্তির নাম ৪	
(২)	পিতৃ/বাচীর নাম ৪	
(৩)	মাতৃর নাম ৪	
(৪)	বজ্রন ৪	
(৫)	ঢেশশা ৪	
(৬)	কর্মরত প্রতিষ্ঠানের নাম ৪	
(৭)	ঠিকানা ৪	
৩।	মনোনীত প্রতিষ্ঠান/সম্বাদ সমিতির তথ্যাবলী ৪	
ক.	মনোনীত প্রতিষ্ঠান/ সম্বাদ সমিতির নাম	
খ.	নিবাকন সংখ্যা ৪	কোথায় নির্বাচিত ৪

গ.	চিকিৎসা & প্রাণ	তানকারি &
উপজেলা &	জেলা &	
ব.	সমস্যা সংখ্যা ৪	
৬.	প্রাচীন/সময়ৰ সবিতর উদ্দেশ্য ৪	
৭.	অঙ্গীকৃত কাজকর্তৰের সংক্ষিপ্ত বিবরণ ৪	
৮.	অধিকার কর্মসূচি ৪	
৯।	কোন কেতু, কোন বাস/বহু/সময়কালে অনুশীলিত বাজি সাফল্য পাও করেছেন ৪ (যুদ্ধবিহীনে উচ্ছ্বেষ করতে হবে)	
১০।	সাফল্য পাও সম্পর্কে তথ্য ও পরিসংখ্যামাত্র সংক্ষিপ্ত প্রতিবেদন ৪	
১১।	অঙ্গীকৃত সাফল্য কিছীবে আনন্দের কৃষি উন্নয়নে অবদান রাখেন ৪ (কৃষি করতে কলা উৎপাদন, শাক-সবজি, ফুল ও ফলের চাষ, গবাদিগত ও ঝাঁঁস-কুড়াশি পালন, মুক্ত বামার, মস্তা চাষ এবং কৃষি সম্পাদ উন্নয়ন কুরআনে)	
১২।	অঙ্গীকৃত সাফল্য অধিকার কৃষি উন্নয়ন কিছীবে সহায়ক হবে ৪	

Figure 6.2: Nomination Form for Bangabandhu National Agriculture Award²

Suggestions: The form is well-defined and there are no ambiguous fields. Every field is well-defined. However, I would recommend that the descriptions be numbered and added as a footer below the form for better aesthetics and data extraction. This would make it easier for users to see what information is required and would also make it easier for you to extract the data later on.

Here is an example of how the form could look with numbered descriptions:

1. Name: Please enter your name.
2. Address: Please enter your address.

2. Website - <http://www.bari.gov.bd/site/page/>

6.2.3. Request for Innovation Idea Form

When individuals wish to submit innovative ideas to the organization, they use the request for innovation idea form. Upon submission of the request for innovation idea form, the fruit research station's dedicated committee carefully evaluates and assesses each proposal, aiming to foster a culture of creativity and continuous improvement within the organization.



সংশ্লিষ্ট সকলের অবগতির জন্য জানানো যাচ্ছে যে, বাংলাদেশ কৃষি গবেষণা ইনসিটিউটে নাগরিক সেবায় উভাবনের কার্যক্রম জোরদার করনের উদ্যোগ প্রথম করা হয়েছে। নাগরিক সেবায় উভাবনের জন্য নতুন প্রযোজনীয় আববান করা যাচ্ছে। সে জন্য সংযুক্ত ফরম-ক পূরনপূর্বক আগামী ২১/৩/২০১৯ তারিখের মধ্যে নিম্নস্মাচকরকারীর নিকট প্রেরণ করার জন্য অনুরোধ করা হলো।


 (ড. মোহাম্মদ আবু তাহের)
 (BARI0104)

পরিচালক (সেবা ও সরবরাহ)

অনুলিপি:

০১. পরিচালক (গবেষণা/সেবা ও সরবরাহ/প্র. ও হো./উদ্যোনত্ব / কন্দাল / তৈলবীজ/গরিকঞ্চনা ও শুল্যাবন), বিএআরআই, গাজীপুর
০২. পরিচালক, তাল গবেষণা কেন্দ্র, সুখরাম, পাবনা
০৩. মুখ্য বৈজ্ঞানিক কর্মকর্তা, মসলা গবেষণা কেন্দ্র, শিবগঞ্জ, বগুড়া/আফলিক ডাল গবেষণা কেন্দ্র, মাদারীপুর
০৪. মুখ্য বৈজ্ঞানিক কর্মকর্তা (মুক্তিক বিভাগ/উত্তিস প্রজনন/কৃষি অধ্যোপ্তা/কৃষিতত্ত্ব/উত্তিস রোগত্ব/কীটত্ব/সরেজমিন/খামার/এসআইসিটি/এফএমপিই/উত্তিস কোলি সম্পদ কেন্দ্র/জীব প্রযুক্তি/বীজ প্রযুক্তি/সেচ ও পানি ব্যবস্থাপনা/উত্তিস শারীরত্ব/পোষ্টহারভেট টেকনোলজী), বিএআরআই, জয়দেবপুর, গাজীপুর
০৫. মুখ্য বৈজ্ঞানিক কর্মকর্তা, আফলিক কৃষি গবেষণা কেন্দ্র (ঘোর/জামালপুর/সুখরাম, পাবনা/আকবরপুর, মৌলভীবাজার/ রহমতপুর, বরিশাল/হাটহাজারী, চট্টগ্রাম/মুড়িরহাট, রংপুর)
০৬. মুখ্য বৈজ্ঞানিক কর্মকর্তা, প্রজনন বীজ উৎপাদন কেন্দ্র, নেবীগঞ্জ, পঞ্চগড়/আফলিক উদ্যোনত্ব গবেষণা কেন্দ্র, চীপাইনবাবগঞ্জ/ পাহাড়ী কৃষি গবেষণা কেন্দ্র, খাগড়াছড়ি
০৭. প্রধান বৈজ্ঞানিক কর্মকর্তা, সরেজমিন গবেষণা বিভাগ, বিএআরআই, (পাবনা/বগুড়া/রংপুর/ফরিদপুর/মুল্লানা/ পটুয়াখালী/ কুমিল্লা/ নোয়াখালী/ শেরপুর/ঘোরা)
০৮. প্রধান বৈজ্ঞানিক কর্মকর্তা, কন্দাল ফসল গবেষণা উপকেন্দ্র, বগুড়া/মুল্লিঙ্গজ/আফলিক মসলা গবেষণা কেন্দ্র, গাজীপুর/ফরিদপুর
০৯. প্রধান বৈজ্ঞানিক কর্মকর্তা, তাল গবেষণা উৎ-কেন্দ্র, গাজীপুর/ফসল গবেষণা কেন্দ্র, বিনোদপুর, রাজশাহী/আর এইচ আর এস, শিবগঞ্জ, নরসিংহপুর/বেগুনপুর, পটুয়াখালী/কুমিল্লা/ শাহিস গবেষণা কেন্দ্র, জৈন্মাপুর, সিলেট/ পাহাড়াক্ষে কৃষি গবেষণা কেন্দ্র, রামগঢ়, খাগড়াছড়ি/ পাহাড়ী কৃষি গবেষণা কেন্দ্র, রাইখালী, রাখালাটি
১০. উর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা, আফলিক মসলা গবেষণা কেন্দ্র, মাগুরা/লালমনিরহাট/লাক্ষ গবেষণা কেন্দ্র, চীপাইনবাবগঞ্জ/ কলেজগাঁও, ঠাকুরগাঁও/কন্দাল ফসল গবেষণা উৎ-কেন্দ্র, মুল্লিঙ্গজ/কৃষি গবেষণা কেন্দ্র, পাহাড়ক্ষে, চট্টগ্রাম/কৃষি গবেষণা কেন্দ্র, রাজবাটী, দিনাজপুর/বেনেতপোতা, সাতক্ষীরা
১১. উর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা, সরেজমিন গবেষণা বিভাগ, বিএআরআই, বরেন্দ্র, রাজশালী/শ্যামপুর, রাজশাহী/ ময়মনসিংহ/ কিলোরগঞ্জ/কুষ্টিয়া/ সিলেট/বাদরবাবন/ভোলা/গোপালগঞ্জ/করকারাই/গাইবান্ধা
১২. উৎ-পরিচালক (অর্থ ও হিসাব), বিএআরআই, গাজীপুর
১৩. সিমিয়ন সহকারী পরিচালক (প্রশাসন), বিএআরআই, গাজীপুর
১৪. মহাপরিচালক মহোদয়ের একাত্ত সচিব, বিএআরআই, গাজীপুর
১৫. অধিস কাপি।

“ফরম – ক”

নাগরিক সেবায় উদ্ভাবন আহবান (প্রস্তাবনা):

উদ্ভাবনের নাম	:
সমস্যার বিবরণ	:
সমাধানের বিবরণ	:
উদ্ভাবন প্রস্তাবের মৌলিকতা	:
বাস্তবায়নের সময়কাল	:
প্রয়োগ দেখা	:
উদ্ভাবনের জন্য অর্ধের চাহিদা (বিভাজন সহ)	:
উদ্ভাবকের নাম ও ঠিকানা	:
নিয়ন্ত্রণকারী কর্মকর্তার সূচারিশ	:



Figure 6.3: Request for Innovation Idea Form³

Suggestions: This form is distributed to the scientists from the institution to request them to invent something for citizen welfare. It is as its requirement and it is only distributed to the person inside the institution only thus there is no need of giving descriptive fields.

3. Website - <http://www.bari.gov.bd/site/page/>

6.2.4. Application Form to Get Information

Figure 6.4: Application Form to get Information⁴

Suggestions: This application form serves the purpose of obtaining information from the Fruit Research Station (FRS), as indicated by its clear and appropriate title. It successfully gathers all the necessary details from the applicant, following proper wording and identification rules throughout the form. The efficient design ensures ease of reading and data entry for the applicants. The order of data items is well-maintained, further enhancing the form's user-friendliness. In conclusion, the form adheres to all the necessary guidelines for creating a proper and effective application form.

6.2.5. Appeal Application

The purpose of an appeal application is to present new evidence, clarify misunderstandings, or highlight errors that may have occurred during the initial decision-making process. The appellant typically outlines the reasons for the appeal and provides supporting documentation or arguments to support their case

ফরম 'গ'	
আপীল আবেদন	
[তথ্য অধিকার (তথ্য প্রাপ্তি সংক্রান্ত) বিধিমালার বিধি-৬ দ্রষ্টব্য]	
বরাবর _____ _____ (নাম ও পদবী) ও আপীল কর্তৃপক্ষ, _____ (সঙ্গের নাম ও ঠিকানা)	
১। আপীলকারীর নাম ও ঠিকানা (যোগাযোগের সহজ মাধ্যমসহ)	ঃ
২। আপীলের তারিখ	ঃ
৩। যে আদেশের বিরক্তে আপীল করা হইয়াছে উহার কল্প (যদি থাকে)	ঃ
৪। যাহার আদেশের বিরক্তে আপীল করা হইয়াছে তাহার নামসহ আদেশের বিবরণ (যদি থাকে)	ঃ
৫। আপীলের সংক্ষিপ্ত বিবরণ	ঃ
৬। আদেশের বিরক্তে সংক্ষুক্ত হইবার কারণ (সংক্ষিপ্ত বিবরণ) ঃ	
৭। প্রার্থিত প্রতিকারের যুক্তি/ভিত্তি	ঃ
৮। আপীলকারী কর্তৃক প্রত্যয়ন	ঃ
৯। অন্য কোন তথ্য যাই আপীল কর্তৃপক্ষের সম্মুখে উপস্থাপনের জন্য আপীলকারী ইচ্ছা পোষণ করেন	ঃ
আবেদনের তারিখ ঃ	
আবেদনকারীর স্বাক্ষর	

Figure 6.5: Appeal Application⁵

5. Website - <http://www.bari.gov.bd/site/page/>

Suggestions: The form has been meticulously designed, adhering to all the necessary rules to create a proper and effective form. The title of the form is clearly identified at the upper part, making it easily recognizable. Fruit Research Station (FRS) has wisely chosen appropriate and concise words, ensuring clarity throughout the form. The arrangement of the form is well-structured, allowing applicants to enter their data seamlessly. The order of items is correct, leading to maximum readability and user-friendliness. Overall, the form maintains a high standard, making it easy for applicants to provide the required information accurately.

6.3. Conclusion

From the above discussion, it can be concluded that the design of the given forms fulfill the major requirements of the forms design. These well-designed forms from FRS (Fruit Research Station) not only simplifies the data collection process but also minimizes errors and enhances overall user satisfaction. It also helps to collect data smoothly and leads to more accurate and actionable information, which is totally easier to understand for the users.

Chapter 7

Cost/Benefit Analysis

7.1. Introduction

Cost-Benefit Analysis (CBA) is an approach that is used by individuals, and businesses to evaluate the costs and benefits of a proposed project or investment. It is a powerful decision-making tool that helps in comparing and assessing the feasibility and desirability of different options. By quantifying both the costs and benefits in monetary terms, cost/benefit analysis provides a standard way to determine the most economically efficient option. It finds out whether the process is worthwhile or not. The main theme of cost/benefit analysis is to weigh the positive outcomes through the benefit against the negative ones through the costs of a given project or decision. As a governmental research organization, the Fruit Research Station (FRS) allocates its budget primarily to research-related work. This includes purchasing laboratory equipment to enhance the lab's facilities and acquiring research materials. Additionally, a significant portion of the budget is allocated to daily fruit cultivation expenses. The organization also dedicates a portion of its budget to training and development programs for its researchers and staff to stay updated with the latest advancements in the field of fruit research.

7.2. Various cost elements

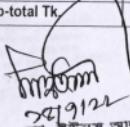
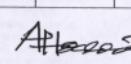
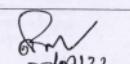
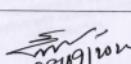
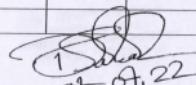
In developing cost estimates for the fruit research station, our team has considered several cost elements:

- Hardware costs
- Personnel costs
- Facility costs
- Operating cost
- Supply costs

7.2.1. Hardware costs

Hardware costs for the fruit research station refer to the expenses associated with acquiring and maintaining physical equipment, machinery, and devices necessary for conducting research and other activities related to the station's functions. These costs may include items such as computers, data loggers, sensors, laboratory equipment, irrigation systems, farming tools, and any other hardware required to support the research and operations of the fruit research station. Due to the confidentiality of the Fruit Research Station's data, our team encountered challenges in collecting the complete list of hardware costs. However, we managed to obtain the annual procurement implementation plan of the Bangladesh Agricultural Research Institute, which provides valuable insights. According to the plan for the year 2022-2023, the institute acquired various laboratory equipment, including autoclaves, incubators, ultrasonic water baths, and refrigerated high-speed centrifuges.

PROCUREMENT IMPLEMENTATION PLAN (GOODS)																										
Budget: Development																										
Ministry/Division				Approving Authority				Source of Fund				Financial Year: 2022-2023														
Agency				Ministry of Agriculture				GOB																		
Procuring Entity Name & Code				Bangladesh Agricultural Research Institute																						
Project Name & Code				Director General, BARI																						
ANNUAL PROCUREMENT IMPLEMENTATION PLAN (GOODS)																										
Budget: Development																										
Pakage No	Description	Qty	Amount (TK Lac)	Procurement Method	Approving Authority	Source of Fund	Time for processing	Tender Invitation	Tender Opening	Tender Evaluation	Approval of Award	Notification of Award	Signing of Contract	Total time of contract Singniture	Time for Completion of Contract											
GD-1	Oxygen/ Carbon di-Oxide Meter	02	30.00	OTM	DG BARI	GOB	08.08.22	16.08.22	05.09.22	14.09.22	19.09.22	21.09.22	16.10.22	60 Days	120 Days											
	Data logger	10	10.00																							
	Refrigerated Hi-speed Centrifuge	01	8.00																							
	Incubator	01	3.25																							
	Water bath	01	3.50																							
	Ultra Sonic Water bath	01	5.00																							
	Shaking water bath	02	10.00																							
Sub-total Tk.		69.75																								
GD-2	Sharing Machine	01	6.00	OTM	DG BARI	GOB	08.08.22	16.08.22	05.09.22	14.09.22	19.09.22	21.09.22	16.10.22	60 Days	120 Days											
	CNC Lathe Machine	01	30.00																							
	Sub-total Tk.		36.00																							

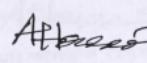
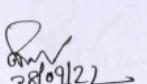
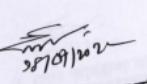
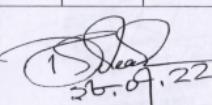
 ড. মোঃ আলতাফ হোসেন
 প্রকৌশল সম্বরকারী পরিচালক
 কার্যালয় কর্তৃপক্ষ, উচ্চ ও
 স্থানীয় পরিষদ (বাবি মুজু)
 বালাদেশ কর্তৃপক্ষ পরিষদ (বাবি মুজু)
 বালাদেশ কর্তৃপক্ষ পরিষদ (বাবি মুজু)

২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২

২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২

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Pakage No	Description	Qty	Amount (TK Lac)	Procurement Method	Approving Authority	Source of Fund	Time for processing	Tender Invitation	Tender Opening	Tender Evaluation	Approval of Award	Notification of Award	Signing of Contract	Total time of contract Singniture	Time for Completion of Contract
GD-3	Autoclave	01	5.00	OTM	DG BARI	GOB	08.08.22	16.08.22	05.09.22	14.09.22	19.09.22	21.09.22	16.10.22	60 Days	120 Days
	Ice Maker	01	5.00												
	Micro-pipette	02	1.40												
	Ultra-Low Temperature Freez (-80°)	01	25.00												
	Automatic Seed Counter	01	5.00												
	Growth Chamber	02	30.00												
	Sub-total Tk.		71.40												
GD-4	Camera & Display Fitted Binocular Stereo-Zoom Microscope	01	28.00	OTM	DG BARI	GOB	08.08.22	16.08.22	05.09.22	14.09.22	19.09.22	21.09.22	16.10.22	60 Days	120 Days
	Camera & Display Fitted Binocular Compound Microscope	01	29.00												
	Sub-total Tk.		57.00												

 ড. মোঃ আলতাফ হোসেন
 প্রকৌশল সম্বরকারী পরিচালক
 কার্যালয় কর্তৃপক্ষ, উচ্চ ও
 স্থানীয় পরিষদ (বাবি মুজু)
 বালাদেশ কর্তৃপক্ষ পরিষদ (বাবি মুজু)
 বালাদেশ কর্তৃপক্ষ পরিষদ (বাবি মুজু)

২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২

২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২

২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২ ২৪/১২/২২

Figure 7.1: Annual Procurement Implementation Plan 2022-2023¹

1. <https://bari.portal.gov.bd/site/page/2449b28a-4262-444f-85cc-12e9ef9db028>

7.2.2. Personnel costs

Personnel costs for the fruit research station encompass the expenditures related to hiring and compensating the staff and researchers working at the facility. This includes salaries, wages, benefits, and any other expenses associated with the employees. The personnel costs are a crucial aspect of the budget, as the expertise and dedication of the team directly influence the success and productivity of the research station. Proper allocation of funds in this category ensures that the station can attract and retain qualified personnel, fostering a conducive environment for innovative research and development in the field of fruit-related studies.

7.2.3. Facility costs

Facility costs for the fruit research station encompass the expenses associated with acquiring, maintaining, and operating the physical infrastructure required for day-to-day operations. This includes initial building acquisition or construction, ongoing utilities like electricity and water supply, maintenance and repair services, security measures, insurance coverage, property taxes, and considerations for depreciation. Properly managing facility costs is crucial for creating a conducive environment that supports fruitful research activities and ensures the station's seamless functioning, enabling researchers and staff to work efficiently toward achieving their objectives.

Figure 7.2: Annual Procurement Implementation Plan 2022-2023²

2. <https://bari.portal.gov.bd/site/page/2449b28a-4262-444f-85cc-12e9ef9db028>

7.2.4. Operating cost

Operating costs for the fruit research station refer to the day-to-day expenses required to keep the facility running smoothly and conducting research activities. These costs encompass a wide range of elements, such as staff salaries, utility bills, laboratory supplies, equipment maintenance, research materials, transportation, communication services, and any other costs directly associated with ongoing operations. By carefully managing and budgeting for these operating expenses, the fruit research station can sustain its activities, support its personnel, and continue making significant contributions to the advancement of fruit-related studies and innovations.

7.2.5. Supply costs

Supply costs for the fruit research station encompass the expenditures related to procuring various materials and resources essential for conducting research and day-to-day operations. These costs may include seeds, seedlings, fertilizers, pesticides, laboratory chemicals, research consumables, office supplies, and any other items required for experimentation, analysis, and administrative tasks. By efficiently managing supply costs and exploring cost-effective procurement strategies, the fruit research station can optimize its resources, maintain a well-equipped facility, and support continuous research endeavors to enhance fruit production, quality, and overall agricultural practices.

Pack age No	Description of procurement Package	Unit	Qty.	Procurement Method & Type	Contract Approving Authority	Secure of Funds	Esti. cost in Tk.(Lac)	Time code for process	Not Used in Goods	Invite/ Advertise Tender	Tender opening	Tender Evaluation	Approval to Award	Notification of award	Signing of contract	Total time to contract signature	Time for completion of contract
GD- 01	2	LS	3	OTM	DG, BARI	GOB	10.00	10-8-21 Started	11	12	13	14	15	16	17	18	
	Dithen M-45	LS					12.00										
	Acrobet MZ	LS					5.00										
	Zampro DM	LS					5.00										
	Mygra 72 WP	LS					32.00										
Sub Total :																	
GD- 02	Nylon Net	LS		OTM	DG, BARI	GOB	18.00	10-8-22 Started		17-8-22	24-8-22	31-8-22	10-9-22	17-9-22	24-10-22	45 Days	45 + 28 = 73 days
							18.00										
Sub Total :																	
GD- 03	Jute sack	LS		OTM	DG, BARI	GOB	20.00	10-8-22 Started		17-8-22	24-8-22	31-8-22	10-9-22	17-9-22	24-10-22	45 Days	45 + 28 = 73 days
							20.00										
Sub Total :																	
GD- 04	Printing goods (Cash, Stock Book & Register Book	LS		OTM	DG, BARI	GOB	10.0	10-8-22 Started		17-8-22	24-8-22	31-8-22	10-9-22	17-9-22	24-10-22	45 Days	45 + 28 = 73 days
							10.00										
Sub Total :																	
GD- 05	Printing goods (File cover)	LS		OTM	DG, BARI	GOB	10.0	10-8-22 Started		17-8-22	24-8-22	31-8-22	10-9-22	17-9-22	24-10-22	45 Days	45 + 28 = 73 days
							10.00										
Sub Total :																	
GD- 06	Printing goods (Envelop small & big, TA Bill Form, Receive Book sales and guest house)	LS		RFQ	DG, BARI	GOB	4.00	10-8-22 Started		17-8-22	24-8-22	31-8-22	10-9-22	17-9-22	24-10-22	45 Days	45 + 28 = 73 days
							4.00										
Sub Total :																	
GD- 07	Stationary goods (Offset paper A4 & Legal)	LS		OTM	DG, BARI	GOB	10.00	10-8-22 Started		17-8-22	24-8-22	31-8-22	10-9-22	17-9-22	24-10-22	45 Days	45 + 28 = 73 days
							10.00										
Sub Total :																	

Deputy Director (P & S)
Procurement & Store Section
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Deputy Director (A & F)
Account & Finance Section

Director (Support Service)
ডঃ. মোঃ কামরুজ্জামান
(প্রিমিয়াম সেবা & প্রযোগসূচী)
বালোচনা সুরক্ষা পরিবেশ ইনসিটিউট
পাট্টাপুর-১০৩

Director General
ডঃ. মোরশেদ সরকার
(অধ্যক্ষিণীক উপায়ুক্ত)
বালোচনা সুরক্ষা পরিবেশ ইনসিটিউট
জামালপুর-১০১

Figure 7.3: Annual Procurement Implementation Plan 2022-2023³

3. <https://bari.portal.gov.bd/site/page/2449b28a-4262-444f-85cc-12e9ef9db028>

7.3. Procedure for Cost/Benefit Analysis

Cost/benefit analysis of the fruit research station is a procedure that gives a picture of various costs, benefits and rules associated with the system. The determination of costs and benefits entails the following steps:

- Costs and Benefits Identification
- Classification of Costs and Benefits
- Select a method for evaluation
- Interpret the results of the analysis
- Take action

7.4. Costs and Benefits Identification

This point indicates all the relevant costs and benefits of the fruit research station project, which can be direct or indirect costs. It is essential to consider both short-term and long-term effects. Most of the budget of the fruit research station is spent on research, including lab equipment and research materials. Additionally, the station incurs expenses in purchasing fertilizers and pesticides for fruit cultivation and research. The list of costs also includes desktop and laptop expenses, stationary goods, electricity bills, air conditioning, and office furniture.

7.5. Classification of Costs and Benefits

Costs and benefits can be classified into various categories based on different criteria and characteristics. Our team has classified all the costs of the fruit research station into three types:

- Tangible or Intangible Costs and Benefits
- Direct or Indirect Costs and Benefits
- Fixed or Variable Costs and Benefits

7.5.1. Tangible or Intangible Costs and Benefits

Tangible or intangible costs and benefits are used to differentiate between measurable and non-measurable aspects of the fruit research station. Our team has classified all the main costs of the fruit research station into tangible and intangible categories.

Table 7.1: Tangible/Intangible costs of the fruit research station

Desktop and Laptop	Tangible costs
Electricity bills	Tangible costs
Air Conditioner	Tangible costs
Printer	Tangible costs
Lab equipment	Tangible costs
Research materials	Tangible costs
Office furniture	Tangible costs

Collaboration and networking	Intangible costs
Innovation and creativity	Intangible costs
Fertilizer	Tangible costs
Pesticides	Tangible costs

7.5.2. Direct or Indirect Costs and Benefits

Direct and indirect costs and benefits are classifications used to distinguish between expenses and advantages that have a clear, immediate impact on the fruit research station and those that are more subtle or secondary in nature. Direct costs refer to the straightforward, identifiable expenses incurred in the day-to-day operations, such as salaries, materials, and utilities. On the other hand, indirect costs are less apparent and may include overhead expenses like administrative costs and shared resources.

Table 7.2: Direct/Indirect costs of the fruit research station

Desktop and Laptop	Direct costs
Electricity bills	Indirect costs
Air Conditioner	Indirect costs
Printer	Direct costs
Lab equipment	Direct costs
Research materials	Direct costs
Office furniture	Indirect costs
Microscope	Direct costs
Fertilizer	Direct costs
Pesticides	Direct costs
Stationary goods	Direct costs

7.5.3. Fixed or Variable Costs and Benefits

Fixed and variable costs and benefits are classifications used to differentiate between expenses and advantages that remain constant and those that fluctuate based on the level of fruit research station activities. Fixed costs are expenses that do not change regardless of the research station's output and include items like rent and insurance. On the other hand, variable costs are directly linked to the level of research activities, such as labor and raw materials.

Figure 7.3: Fixed/Variable costs of the fruit research station

Desktop and Laptop	Fixed costs
Electricity bills	Variable costs
Air Conditioner	Fixed costs
Printer	Fixed costs
Lab equipment	Fixed costs

Research materials	Variable costs
Office furniture	Fixed costs
Microscope	Fixed costs
Fertilizer	Variable costs
Pesticides	Variable costs
Stationary goods	Variable costs

7.6. Select a method for evaluation

There are many methods to evaluate the costs and benefits -

- **Net Benefit Analysis:** It means subtracting total costs from total benefits. The main disadvantage is that this process doesn't calculate the time value of money which is very important. The formula of net benefit analysis is -

$$F = P(1+i)^n$$

Where,

F= Future value of an investment

P=Present value of the investment

i=Interest rate per compounding period

n=Number of years

- **Present value analysis:** It is the solution of net benefit analysis. It handles all the problems and calculates the costs and benefits of the system considering today's value of the investment.
- **Net Present Value:** It takes into account the time value of money which means that a dollar received today is worth more than the same dollar received in the future due to some factors like opportunity cost, and risk. It is presented as a percentage of the investment.
- **Payback Analysis:** It is also known as the payback period method, is a simple financial analysis technique used to evaluate the time it takes for an investment or project to recoup its initial cost or investment outlay. If the payback period of a project is shorter or equal to the management's maximum desired payback period, the project is accepted, otherwise rejected. The formula for the payback period is -

$$\text{Payback Period} = \frac{\text{Invested Required}}{\text{Net Annual Cash Inflow}}$$

- **Break-Even Analysis:** Break-even analysis means the point where the total cost and total revenue are equal. The formula for break-even quantity is:

$$\text{Fixed costs}/(\text{Sales price per unit} - \text{variable cost per unit})$$

Therefore, the concept of the break-even point is as follows:

When Revenue > Total Variable cost + Total Fixed cost, it is profit

When Revenue = Total Variable cost + Total Fixed cost, Break-even point

When Revenue < Total Variable cost + Total Fixed cost, Loss

- **Cash Flow Analysis:** It focuses on assessing the movement of cash in and cash out of a business or investment over a specific period. It keeps track of accumulated costs and revenues regularly.

7.7. Interpret the results of the analysis

The evaluation of the costs/benefits analysis involves interpreting the results by comparing them with standard benchmarks or alternative investment options. This interpretation and decision-making process rely on subjective judgment and intuition, particularly when facing uncertainties and diverse potential outcomes. As a government organization with confidential costs and revenue, our team cannot conduct the costs and benefits analysis, nor interpret the results. The Bangladesh Agricultural Research Institution handles the interpretation to determine the budget for the fruit research station.

7.8. Take action

After analyzing the costs and benefits of the fruit research station, the Bangladesh Agricultural Research Institution should take appropriate actions to maximize the organization's benefits.

7.9. Conclusion

In conclusion, the Fruit Research Station in Rajshahi plays a vital role in the district's and country's agricultural sector. By conducting research on different types of fruits, the station helps to improve crop yield and quality, develop effective strategies for disease and pest management, promote sustainable farming practices, and contribute to economic growth. The station also plays a role in knowledge generation and transfer, which benefits farmers, scientists, and policymakers. While the specific cost and benefit sectors of the station may vary based on its specific objectives, research focus, and priorities, the overall benefits of the station are clear. The station is an important investment in the country's agricultural sector and its future.