North South University

CSE 499

Project Proposal

Project Title

Amago

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‘Amago’ Proposal

Title of the Project: *‘Amago’ is a digital hub that aims to directly and efficiently connect independent farmers to retailers whilst making fair and optimal use of market information*

Problem Statement: Bangladesh predominantly suffers from a lack of proper infrastructure in key areas of food supply and demand. Even today Agriculture is still heavily analog and dependent on third party merchants to push product to retail stores. This can heavily increase prices and often times there is no regulation to what the market needs. We believe this supply, demand and logistic problem can be solved through technology. We need to structure and analyze what the market tells us through sales and production data. All this data can then be used to help make systems that can control the market to offer best prices for consumers and profits for sellers.

Currently there exists no such solution in the market and is the perfect opportunity for such an initiative. There are several challenges that have affected the agricultural industry over the years, this includes climate change, imbalanced use of fertilizers, inefficient use of water, pests, lack of quality seeds, inadequate credit support, unfair pricing and insufficient investment in research (Mondal, June 2010) .The problems we want to tackle initially with the ‘Amago’ platform are unfair pricing and insufficient investment in research.

Bangladesh Agriculture at a Glance

Total family	:	2,86,95,763
Total farm holding	:	1,51,83,183
Total Cultivable land	:	85,60,964.75 hectare
Total irrigated land	:	74,06,822.87 hectare
Cultivable waste	:	2,10,027.92 hectare
Cropping intensity	:	192%
Single cropped area	:	23,54,821.74 hectare
Double cropped area	:	38,47,274.49 hectare
Triple cropped area	:	17,15,430.38 hectare
Net cropped area	:	79,30,071.63 hectare
Total cropped area	:	1,52,45841.93 hectare
Contribution of agriculture sector to GDP	:	14.75%
Total food crop production	:	Rice-347.101 lakh mt wheat-13.48 lakh mt Maize-27.59 lakh mt

Source: AIS-2017, MoA (Extension-2)-December/2016

Productive farmers of Bangladesh mainly belong to small and marginal categories. These farmers do not have either Farmer’s Association or Farmer’s Co-operative to bargain for fair prices of their produces. They are thus forced to sell their products at low prices to intermediaries. Since the farmers are often unable to meet procurement requirements (14% moisture content, absence of foreign materials in seeds, etc.) of the government, they cannot sell their produces at the price fixed by the government.

Storage facilities may be established in rural areas which is likely to allow the farmers to store their produces and sell the same at better prices when the demand is high. This digital storage facility would help connect retailers with farmers on a larger scale.

Target Demographic: This project aims to be of service to independant farmers or anyone producing fresh harvests looking to sell their goods easily and to retail, grocery, super shops and restaurants who are in need of supply of said produce.

Project Proposal/ Project Summary:
We propose an efficient, semi-automated produce warehousing platform that will quickly accumulate produce directly from the farmers based on market demand and ship them to urban retail grocery stores.

Farmers will post a sell request through an android application. Our system will process these requests and accumulate the produce until reaching maximum storage capacity. Retailers will be able to order through a online web interface, once an order is received it will be directly shipped to their specified store/outlet. The optimization objective of the platform is to minimize the time the produce spends inside the warehouse.

Solution:

The proposed system will operate using a postgresql RDMS (Relational Database Management System) database. The database will log user account details, transaction requests, warehouse inventory, retail chain store inventory, logistic information. The backend will be managed using node.js. The robust framework will be used to create APIs (Application Programing Interface) that will be used for communication with the server through an android application/web interface. There will be two seperate android applications one for farmers the other for drivers of logistic vehicles.

The android applications will use Google's map API, our server API and the UX will follow Google's "Material Design" principle.
Farmers will be able to post sell requests through our app. The request will be sent to the server through our API. The request will be logged in a database table. The request will then be processed by checking our warehouse inventory, retail order demands. If requirements are met the request will be accepted. The request will then be sent to the driver app through our API as a json response. It will contain the geolocation of the farm along with produce information such as type,quantity e.t.c. The driver can choose to accept the delivery and deliver it to our warehouse. Upon delivery our database will be updated.

Our retail clients will be provided with a web interface. The web interface will be a dynamic website designed using html,css, javascript. The clients will be able place orders for produce based on their needs.

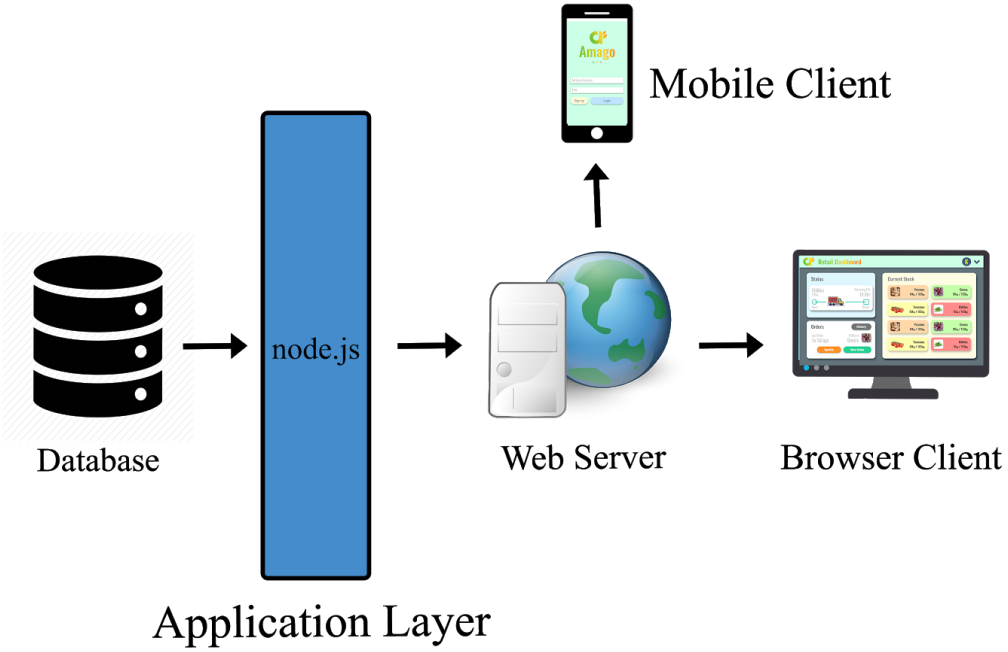


Figure: Architecture Diagram

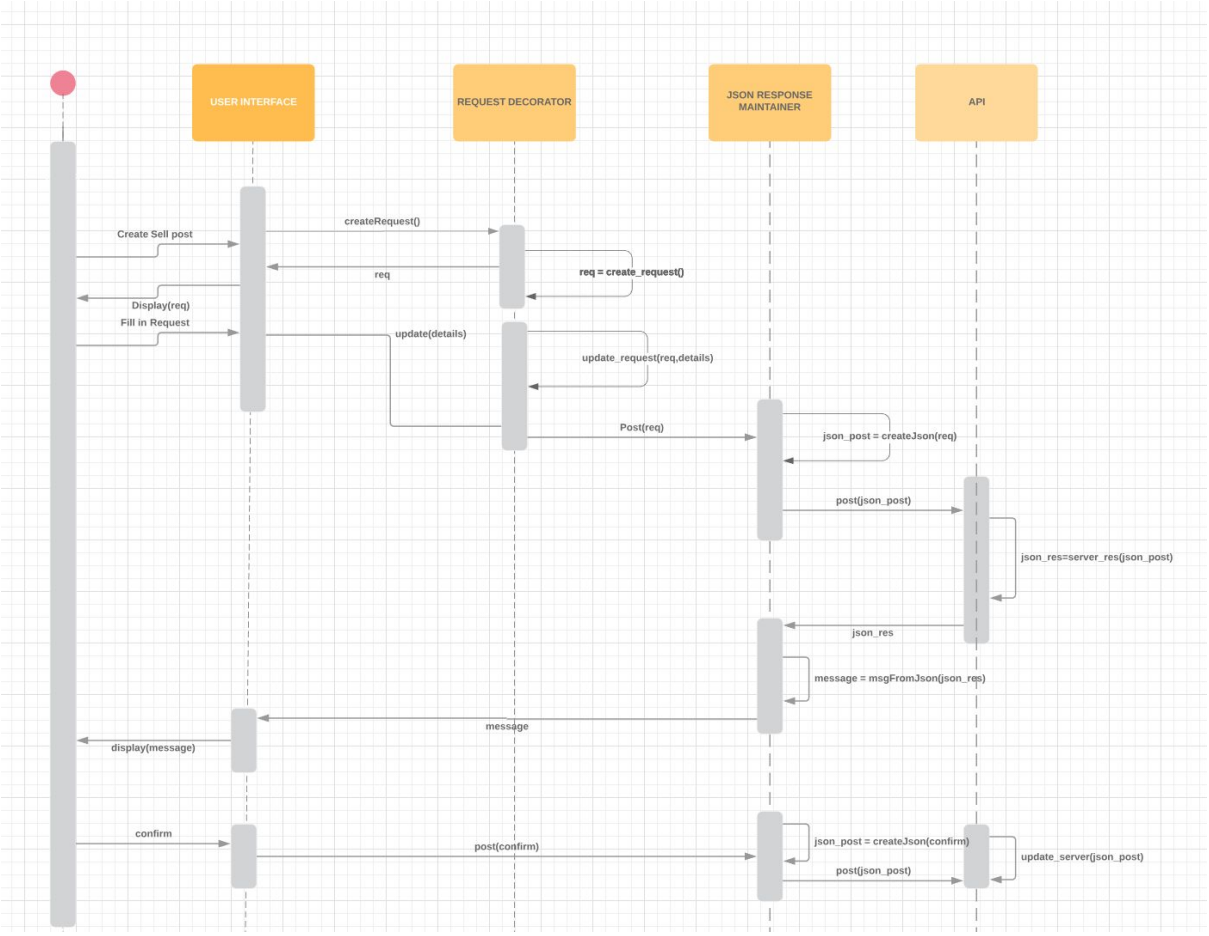


Figure: Sequence diagram of the farmer application

Required Software Knowledge:

Technology	Reasoning
Node.js	Node.js is an extremely versatile backend framework that has seen extensive industrial usage. The framework provides excellent tools for creating APIs that will be used by our applications to communicate with our server and database.
PostgreSQL	PostgreSQL provides a "complete", tried and tested implementation of SQL which follows the ACID principles. It natively supports many advanced SQL

	functionalities and allows for faster deployment with minimal tweaking.
Java and Android Studio	Java is a performant and widely known scalable application programming language. It has automated memory management and taking advantage of features is much more streamlined as it is Object Oriented. Android Studio is the platform where the app is to be implemented which allows fast prototyping, API handling and debugging.
HTML, CSS, Javascript	HTML is the world standard for building smooth simple but aesthetically pleasing frontend web interfaces. CSS allows for animations and styling while JS lets functions and business logic run in the background of the site and is a highly readable and scalable tool.
Python	Python is enriched with many powerful statistical testing and machine learning libraries. These libraries will be used extensively when implementing our statistical testing platform and machine learning model for demand prediction.

Overall Objectives of the Project: ‘Amago’ is to be a digital hub that aims to connect independent farmers to retailers directly. Not only does it want to just connect these two sides but also wants do it most efficiently using information based on market behaviour and artificial intelligence.

Bangladeshis especially suffer from fluctuating prices of produce due to several factors, such as transport costs, seasonal supply demand changes, forced price inflation by stocking goods when demand is high and many more. Each of these factors is a unique problem but some of the solutions to these problems are data driven. For example, when farmers produce too much product and respective demand is not up to the same level, farmers lose money and a lot of the production is wasted. This could have been easily solved by researching demand supply data for products to predict to a certain accuracy of how profitable it would be to produce a certain crop. Another example would be the unregulated middle man that independent farmers interact with to get their products to retailers. This buy and resell procedure, including the transport and logistics, increases the price of produce by every kilometer. These are situations that justify the existence of systems such as ‘Amago’.

Output of the Project: The project will have the following outcomes:

1. Segment the Client Types
2. Android App for Produce
3. Web Interface for Retail
4. Database Storage
5. Introduce to IRL users
6. Leverage Data for prediction models

Figure 1: Android App Designs for Produce Side Users

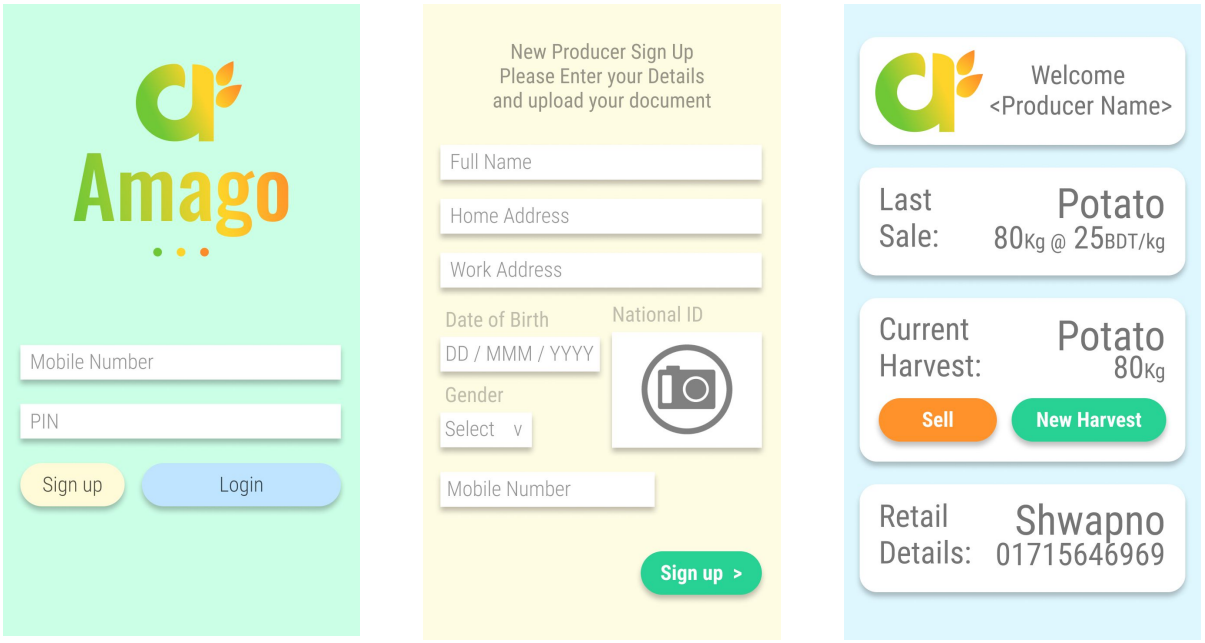
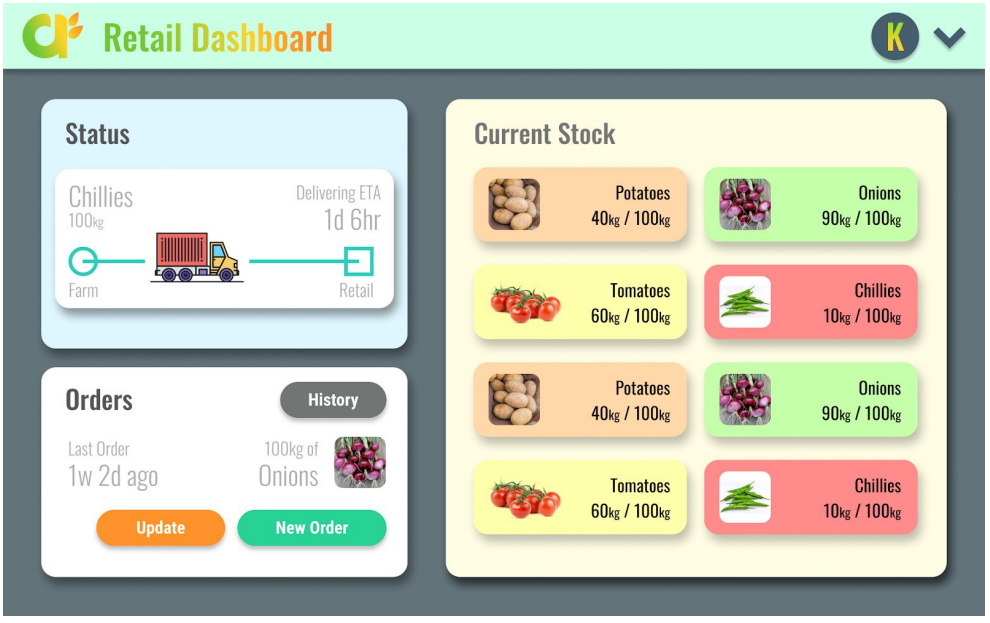


Figure 2: Web App for Retail Side Users



User Story:

User Case 1: Produce

Mr. Rahim is an independent farmer. This month he acquired a good potato crop yield but he does not have a mediary contact to whom he can sell it to.

- He opens up the Amago Produce App and enters his credentials (ph num/name password)
- Taps the button for putting his yield up for sale
- Suggests his favorable price and posts
- Our system evaluates his produce to find an optimal offer on the market based on demand and current pricing
- Notification pops up (with bangla audio perhaps) letting him know when his produce is ready for pickup, mentions the name of the logistics personnel, details and an approximate time when they might arrive
- The logistics personnel arrives, receives the produce and Rahim confirms that the transaction has been completed properly.
- He is a happy man, who was given fair pricing. No haggling required.

User Case 2: Retail

Ms. Nabila is currently a branch manager at Shwapno. She finds out that their stock has a low supply of potatoes and will not last the coming week.

- She opens up the Amago Retail Web Interface and logs in
- Scrolls through the list of Shwapno outlets and selects the one she works at
- Since she is a manager, she has the privilege of placing an order for any amount of any particular item.
- Our system displays current supply, offers and pricing. Finally picking stock from producers that are at an optimal
- Notification pops up letting her know stock from a number of producers was found that matches her order for potatoes
- She sends the order, the product is then delivered out to her
- Once delivered, Nabila confirms the produce she received
- She is relieved, since her stock is now full and ready for the weekend rush

User Case 3: Logistics

Mr. Shaon owns a truck and needs some quick cash doing some long hauls.

- He opens up the Amago Transport App and logs in
- Searches for any pending delivery requests
- Our system provides him with the most urgent and/or closest delivery order
- He drives to all the necessary producers and collects the produce. Or he delivers the produce stored in our warehouse to the retail.
- Shaon drops off the produce where asked and is paid when the delivery is confirmed
- He can rest knowing he did an honest day’s work

Development Plan: The project development will be conducted in a number of phases. They are planned as follows.

Development methodology to be used is Agile. Each cycle will be around 2 weeks long. In each cycle the development team will be updating the product with major features. A three member team will be collaborating together to bring the project to life.

Phase 1: Research

- This phase will work with researching the technological factors to be used and the market research to collect vital data about the implications of the product.
- Deliverable: Research material and datasets to progress to building the AI model for the platform.

Phase 2: Core Development

- This phase shall oversee the preparation of the minimal viable product (MVP). This includes the UI/UX, frontend and the backend development. All the sections will be completed to meet the basic requirements of the project.
- Deliverable: At the end of this phase, there will be a useable platform that will fulfill the basic user use case stories provided above. Performance and user experience will be acceptable.

Phase 3: Performance optimization

- This phase will concern performance optimization and bug fixes. Performance optimization of the website and backend services will be done.
- Deliverable: At the end of this phase, the platform will be tuned and optimized for the maximum user experience metrics.

Phase 4: User testing

- This phase will concern the end user experience. Rigorous testing of the platform will be done in this phase, starting from user testing to internal code tests to make sure the system is easily accessible yet secure.
- Deliverable: At the end of this phase a final report will be published stating the progress of the project.

Major milestones: The proposed research and development project is expected to achieve following milestones.

1. SRS (System Requirement Specification) report preparation.
2. Web based system and mobile application development and deployment for both produce and retail.

Gantt Chart:

	Month							
Major Milestones	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Requirement Analysis								
Market Research and Data Collection								
Backend system development								
Android App development								
Web Services								
Feedback and UI Changes								
Final Report								

What makes the solution an 'innovation'?

The proposed solution will truly count as innovation since nothing like this has been implemented before in Bangladesh. Innovation in the agriculture sector has not been scaled using digital technology and hence provides a perfect opportunity for the 'Amago' platform to thrive. Production to retail management in terms of agriculture goods has not be done before, not only this management of production yields and logistics has also not be done. Prediction models for supply and demand will also be a new introduction to the market. These technologies can change the playing field for the good of the consumers and suppliers.

Expected results of the project?

Improvements in the quality of life and day to day activities can be expected for the targeted independent farmers and logistic personnel. The expected results of the project are as follows:

1. Farmers are expected to receive fair pricing on their production as 'Amago' plans to remove the middle man in the transactions.
2. Farmers can stay connected to the market more easily as vital supply demand information will be provided to them
3. 'Amago' hopes to uplift farming as a profession, by helping farmers earn more and showing that it is a well respected lifestyle. These people feed us and we would go hungry without them.
4. Help farmers modernize their processes and bring new innovative technologies to them to help them transition into the 21st century.
5. Help farmers export their products abroad by trying to create a direct channel for them to operate.
6. Create more jobs for logistic personnel and independent drivers.
7. Create a fair pricing and regulation standard for the drivers of long haul deliveries.

How the project will become sustainable?

Initially, the project requires funding from investors. The initial funding will be used to fund the development phase and a portion of the marketing. Our sustainable business model would be to charge a 2% (subject to change) flat service charge on the overall order. However, we do not plan to solely rely on this but rather utilize the data we collect over time to create some other additional sources of revenue.

Is there any possibility to scale up the project?

Scalability of the project is massive. Initially we would be entering the market as a platform that connects suppliers to retailers in the most efficient way possible but with time as we grow our database with information regarding supply, demand and crop yields, we would be

able to diversify into providing market analysis. Not only this, the farmer application can be used to collect vital information about the farmers land and crops, which can be later processed to help farmers obtain higher crop yields based on crop optimization. The farmer application can also work as an information hub for farmers providing advice, a marketplace for farmers to order equipment, fertilizer, other essentials etc.

Is there any opportunity of income generation from the project?
As mentioned earlier, the project has a high potential for income generation. Initially revenue will be generated on a flat 2%(subject to change) service charge added on top of each transaction. A real life assumption can be made, a seller 'A' wants to sell 1 tonne of onions at wholesale price (100 kg = 1562 BDT, set by the ministry of agriculture), therefor total of 15620 BDT. If you add logistics on top of this, then an approximate addition of 5000 BDT(subject to location), and the total becomes 20620 BDT. Amago takes 2% of this, which is about 413 BDT, so the total price retailers pay is 21032 BDT. Assuming Amago initiated 500 of such onion orders, then we make approximately 206500 BDT. This amount is only for one particular product and can be scaled to more products.

Do you need financial support for future extension?
After the initial investment, it will take some time to familiarize the product to the market and might not be making any profit. However, in the long run, profit will hopefully be made. To reach a profitable state, more research and development would be needed and this would require further financial support.

How people will be benefit from the project?
The instant benefit of the project will be enjoyed by the farmers and logistic personnel. But down the line it would have a massive impact on the way retailers buy produce. Farm to retail procedure would be structured and tracked leaving no place for bad quality produce to make it to shelves. Research and development will be done based on the data acquired to help farmers make better yields and quality produce.

Monitoring mechanisms:
The project will be monitored and reported about in two phases. They are as follows.

1. **Research and Development period:** During the research and development period, after every development phase a progress report will be submitted to the responsible authority. The report will include development risks, time of development and outcome of the development period.

2. **After deployment phase:** After the development is completed, the system will be deployed and ready to use. Metrics such as website hits, users, transaction details, etc will be monitored and detailed reports will be submitted to the responsible authority to show performance updates of the complete product.

What are the risks? How the risks will be managed?:

Every venture has risks and challenges. However difficult, most of them can be overcome. Amago is no different, there are some risks involved in this particular venture.

1. Might be difficult to convince retailers to buy from us. This could be initially managed by allowing retailers to use our services for free for a trial period of time. After that there could be reward programs that allow retailers to earn certain benefits if they buy from us regularly.
2. Farmers might not provide accurate information and quality products. This could be solved by issuing moderators to overview the products and information collection.
3. Farmers might not be able to use our technology. This can be solved by providing free training and creating awareness campaigns.
4. Farmers might not be willing to sell to us or sell using our platform. This can be solved by providing farmers with certain benefits and reward programs.
5. Logistic unions setting high prices. This might be one of the most difficult to manage situations, however, working with these unions can let us create price packages to operate under.

What is the poverty relevance?

Poverty is still a major problem in rural Bangladesh, farmers being a majority living under the poverty line. Amago aims to provide farmers with the platform and fair pricing to help them uplift themselves above the poverty line by sheer hard work. No donations, rather a opportunity.

What is the value for money?

Value for money is extremely high. Farmers contribute to the economy heavily. This project will help farmers achieve higher contributions. For example, agriculture exports can be a massive factor in the growth of the Bangladesh economy. Even lessening the load of imports can change the balance to help further develop the nation.

What is the positive impact on environment?

Environmental impacts can include utilization of arable land and since most of the inventory will be done digitally, there will be significantly less use of physical paper. Overall contributing to a positive environmental impact.

Budget:

Required budget (including breakdowns and shared cost):

SL#	Item Description	Amount
1	SRS (System Requirement Specification) report	100,000
2	Market research (on the field data collection and survey)	300,000
3	Computers, laptops, smart phones and tabs	800,000
4	Web based system design and development	500,000
5	Mobile application development for target users	400000
6	Server procurement / rent	200000
7	ML/AI Model development	400000
8	Advertising through newspapers, on the field agents, etc	800000
9	Warehouse and storage equipment	10,000,000
10	Logistics	10,000,000
11	Final report on the effectiveness of the project	100,000
11	Miscellaneous	50,000
	Total	**23,650,000**

Procurement Plan

What		Why	When	Amount
Description	Type	Reason	Timing	Tk.
Computers, laptops, smart phones, tabs	Hardware	For developing and testing the system	Within two weeks of project offering (PO)	800,000
Consultancy on SRS report	Consultancy	For better understanding of system requirement and target demographic	Within one months of PO	100,000
Web based System	Software	System development	Within one months of PO	500,000
Mobile Application	Software	Mobile app development	Within two months of PO	400,000
Warehouse and Logistics	Hardware	For physical management of products	Within seven months of PO	20,000,000
Server procurement / rent	System	Deploying the system for target users	Within six months of PO	200,000
Advertisement through newspaper, on the field agents, etc.	Media	Not the mainstream functions of the project	First seven months after PO	800,000

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