

AgroDefence: Engineering for Agriculture



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Abstract: *Today's world is unimaginable without technology, which plays a key role in all fields of society. We see numerous technological developments in all kinds of fields like automobiles, communication, Artificial Intelligence, etc. So, we have come up with something which can help the agricultural sector. The main aim of this application is to create an interface between farmers and farm produce consumers and it connects farmers across India with the end buyers eliminating the middlemen. To help the farmers, the buyers can pre-book for a crop so that farmers don't need to take a loan. Without added expense to promote and distribute products farmers can earn better prices for their products and Seasonal crops like mango, rabi, peas, barley, etc. may drive to large market potential like paddy, wheat, etc. will regulate sales in local areas too. The farmers can achieve huge market potential through the transport of these seasonal crops. Mainly this application works throughout the process i.e., pre-processing, processing and post-processing of the crop and interfacing farmers with technological aid to address the labor shortage, product knowledge on chemical inputs and market linkages. This is how we imagined modern technological advancements in the development of the most underrated yet the most important sector i.e. Agriculture. This way the farmers can not only make additional income but also can live with contentment*

Keywords: Smart Farming, Agri 4.0, Data Science, Internet of Things.

I. INTRODUCTION

As per census 2011, in India out of 121cr population about 11.89cr cultivators across the country or 24.6% of an overall workforce of over 48.1cr [1]. The range of farmers' suicide rate in India is between 1.4 and 1.8 per 100,000 total population, over a 10-year period through 2005. However, the figures in 2017 and 2018 showed a median of over 10 suicides daily [2].

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Agriculture is the primary source of livelihood for about 58% of India's population. In India present scenario is farmers are communicating with middlemen who in-turn deal with buyers of other states [3]. But these middlemen buy the crop from farmers at a very low price and make huge profits by selling the identical crop at a high price.

Hence the farmer will bear huge losses. They can't afford for his or her next crop and hence the extra loss.

We want to create an application where will be supplying farm products for a better price with good quality i.e., directly from the farm to consumers hence the farmers will also get a good amount for their produce.

Technology made communication and sharing data across the globe easier and more affordable. We, the AgroDefence team, want to use these evolutionary communications to deliver simple services to farmers, to help them improve their way of working and living. The team is developing an application that can provide the following services,

Crop Dynamics:

This feature guides the farmer through the entire cropping season from picking his crop to selling his produce most effectively. This feature can be classified into three sub-features:

1. Pre-Crop Dynamics.
2. On-Going Crop Dynamics.
3. Post-Crop Dynamics.

Pre-Crop Dynamics:

Depending on many inter-related parameters, we assess the local conditions, as in available resources and weather, to suggest the selection of crop as well as suitable cultivation methods. We also project the local market demand for the crop along with suggesting the crop and its cultivation methods. We also provide to order required seeds and man force [4].

On-Going Crop Dynamics:

After selecting the crop, the farmer now receives guidance on the cultivation of the crop intending to gain good productivity. The guidance includes regular updates on crop growth, irrigation management, and land and nursery preparation. This is also inclusive of handling the plant at very early stages as in transplantation (if any), nutrient management and alerts for pest control using locally available pest control agents. Going further, we provide regular timeline-idealistic- condition images and videos and also possible deviations with their solutions. We also provide to order required fertilizers and man force (if Required) [5]



Post-Crop Dynamics:

We intend to guide the farmer en-cashes produce, by providing post-harvest measures like quality checks, storage, transport, value addition tips to increase the shelf life of the produce and other economic measures that could potentially profit the farmer and we also create an interface between farmers and farm produce consumers.

The application provides services to both farmers and consumers(customers) where the user has to login with their credentials.

II. APPLICATION INTERFACE FOR FARMERS

The application shall be multilingual so that the farmer can choose their local language for convenience. The farmer registers into the application, and then the access shall be granted upon verification. Once the farmer is authenticated the location is traced and appropriate boundaries are set. Then the farmer can create his/her profile with the basic information and then the application provides services in three phases as shown below.

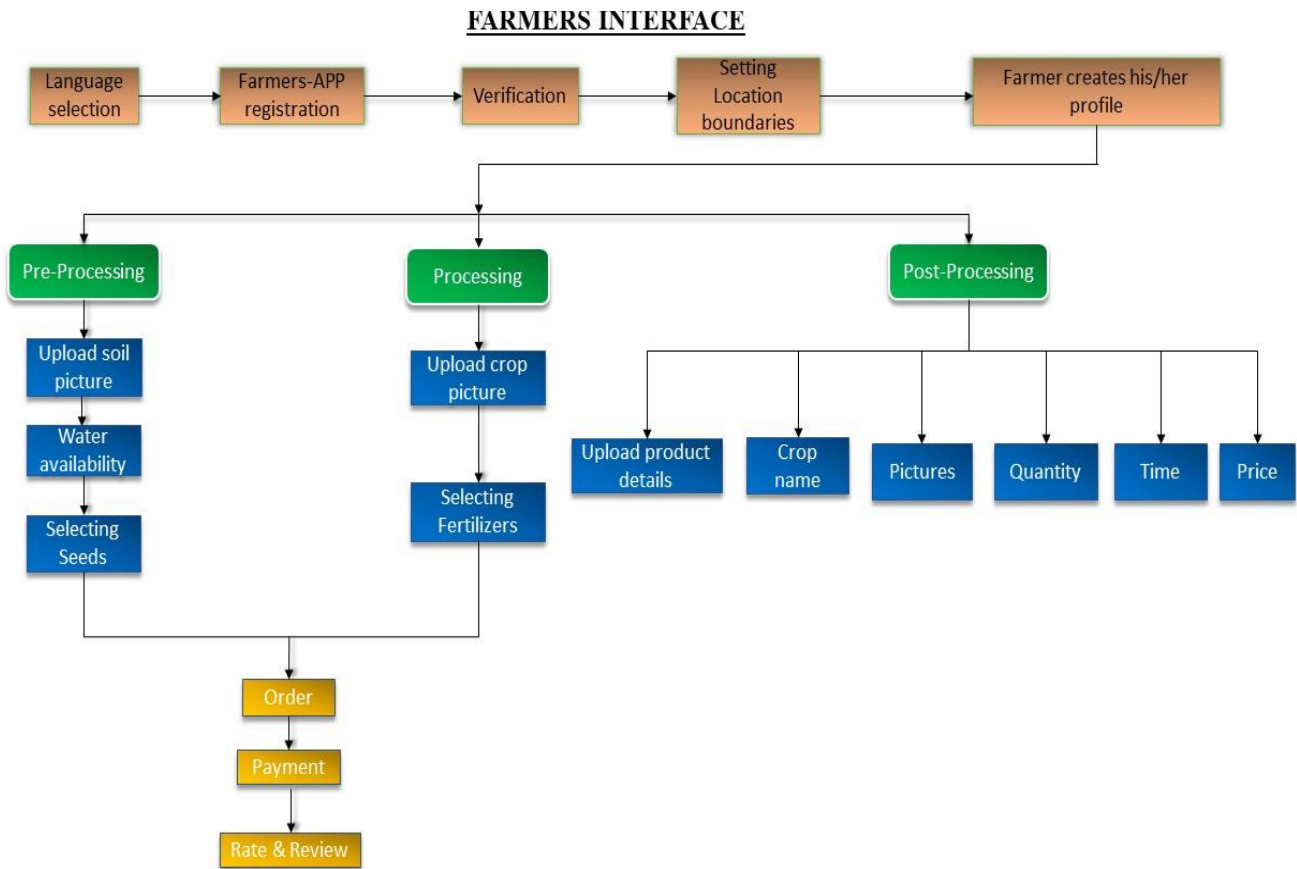
They are as follows:

Pre-Processing:

In this phase, the farmer uploads their soil pictures and other details like water availability, soil properties, etc. After examination of all the factors, the application suggests which seeds to harvest. The farmer can order required seeds from the application itself and choose the mode of payment either to pay online or at the time of delivery. He/she can also write a review of the product received.

Processing:

During the processing phase, the farmer can upload a picture of their crop where the application shall examine the crop growth and suggest required fertilizers for the crop. The farmer can choose to buy the fertilizers from the application itself and the payment procedure remains the same as in pre-processing. They can also choose to review/rate the product from that particular supplier or not.



Post-Processing:

After the harvest of the crop, the farmer creates their profile as a seller and uploads the details of their crop which include crop name, price, quantity available, pictures, etc. The farmer can set prices for their crops as they wish and provide delivery services as well.



III. APPLICATION INTERFACE FOR CUSTOMERS/CONSUMERS



Figure 2. Application interface for customers

The customers follow a similar procedure for registration where he or she provides the basic information and sets up his/her location to find nearby sellers. He/she can search for required products and also favorite for them for later and can contact the seller either through call and negotiate the price. The application also provides a compare feature where the customer can compare various aspects like cost of the product, quality, delivery charges, delivery time, ratings, etc. and decide which product to be bought based on their preferences. After the negotiation, the customer can either pay online or cash on delivery. Once the mode of payment is set, he/she orders the products and can choose the delivery method as per their comfort. They can choose for a pickup from the farm directly or get it delivered to their doorstep. The customer can also opt to write a review for other users.

IV. APPLICATION FEATURES & SPECIFICATIONS

The app will undergo continuous evaluation through feedback from the end-users which will be reflected in its extended development.

Updates:

Farmers will be receiving suggestions that are majorly related to the recent advancements in farming techniques and technologies. Also, updates on the availability of different HYV (High

Yielding Variety) seeds, natural fertilizers in our store and their preparation and pest control agents will be received. These suggestions are also helpful for urban model farming, as in rooftop gardening and community farming in gated residential communities. To make the content user-friendly, these suggestions are sent multilingual, multimedia format (media involves videos, images, animated gif's) with minimal text to avoid language barriers.

V. ALERTS & SUGGESTIONS:

Different types of suggestions and alerts are sent to the user based on their location, through GPS inputs, parameters like soil conditions, weather, etc. and forecasts. Local-level alerts weather related forecast and the consequential measures to be taken. Market level projections inform the farmer about the demand for a particular produce and send suggestions on the same. A progress bar is displayed for a specific crop and its corresponding lifecycle stage is shown, to give cultivation alerts.

Along with the notifications implemented through feedback, the scalability of the application will also be driven by media analytics, as in the influence of different Geographic's and demographics of the users of the application and so on.

VI. BACKGROUND

Vision:

We, the AgroDefence team, believe that strengthening agriculture will be instrumental in transforming the heavily agriculture-dependent rural expanses to self-sustained, prosperous economic contributors of the country.

Approach:

To understand village dynamics, we traveled across villages and contacted farmers, agriculture scientists, industry experts, rural innovators and several other people involved in farming and rural development constantly consult them to establish and improve data as well as iterate the solutions.

Along with making a list of available resources the team also identified a few critical problems in the current agriculture scenario. To understand better the dynamics in a holistic manner, we camped in a rural region of Andhra Pradesh and visited several research stations. We also traveled, on a weekly basis, to agriculture- intensive micro-economies and interacted with farmers to understand these root level problems.

Value Proposition:

AgroDefence is a multisided platform and as such it has to have a value proposition to both sides, the farmers as well as the customers. For customers, the value propositions are that it is the best way to get around, to be able to meet a farmer with one tap and negotiate directly for a better relationship. For framers, the value propositions are to that eliminating the middlemen and labor shortage. Famers are turning into smart farming.

VII. INVESTMENT

Shared Hosting:

The main objective of shared hosting is to provide information regarding the farming to the farm holders. Based on the research done on the soil fertility and conditions by the company executives, directions are given to the farmers to cultivate specific crops in the specified season. E.g.: Black soil is suitable for paddy when there is a huge facility. So the amount required for the research and information to gather is ten thousand rupees (10,000/-Rs) per year following three years making it thirty thousand rupees (30,000/-Rs) as a whole.

Dedicated Server:

Huge database requirements are followed by the need for a private server. A company server is to be created and maintained accordingly for the digital mode of transmission done like holding all the private information of the company, and to perform digital transactions, daily basis work done by the executives, etc. The amount required for the server management system is one lakh forty-four thousand rupees (1,44,000/- Rs) annually making it four lakhs thirty-two thousand rupees (4,32,000/- Rs) for the three years.

crops and all the necessary information required for the farmers based among the vast area is to be recorded in the database. This database is maintained by trained personalities. The maintenance cost of the database is seventy- two thousand rupees (72,000/- Rs) for three years making it twenty-four thousand rupees (24,000/- Rs) annually.

Development Cost with Maintenance:

For developing all the above requirements, we have to consult an IT professional. It takes a certain time and amount to develop all the databases and servers. The amount required for the development and thereafter updating for 3 years is one lakh fifty thousand rupees (1,50,000/-Rs) making it fifty thousand rupees (50,000/-Rs) annually.

Farmer Training:

As the farmers are unfamiliar with all these techniques used by the company and they are should be trained by some techies. The techies should be hired locally based on the familiar faces to the farmers. They should be paid accordingly. Each farmer will get two hundred and fifty rupees (250/-Rs) to get trained. Our target is to train thousand (1000) farmers per year making it seven lakhs fifty thousand rupees (7,50,000/-Rs) for three years and these 3000 farmers will act as volunteers for future reference of the company.

The total amount for our company investment is fourteen lakhs thirty-four thousand rupees (14,34,000/- Rs).

Timeline:

Time is also a basic objective that is to be monitored for developing the databases and servers we have to set time limits for the job assigned to consultancies.

APP Development:

App development requires one hundred and eighty (180) hours of man work for 6 days a week for a month.

Digital Literacy:

As the farmers are trained until they achieve perfection it requires three hours of training for a week for one month. This is a smart way for community building.

VIII. TECHNICAL SPECIFICATIONS

Technology Stack



Sl. No	Expenditure	Unit Cost (In Rs.)	No of Years	Total Cost (In Rs.)
1	Shared Hosting	10000 (Per year)	3	30,000
2	Dedicated Server	1,44,000 (Per year)	3	4,32,000
3	Database	24000 (Per Year)	3	72,000
4	Development Cost with maintenance	50000 (Per Year)	3	1,50,000
5	Farmer Training	2,50,000 (250 Rs. per farmer to train targeted 1000 farmers in a year)	3	7,50,00
Total Cost				14,34,000

Private Database:

All the information about the buying and selling process of



1. **Android Studio:** To build the interface for farmers and consumers.
2. **MySQL:** Database to store the details of farmers, crops, products available, customers, etc.
3. **Google maps:** To trace the locations.
4. **Image Classification:** To suggest the seeds and fertilizers.
5. **Flutter:** App Development.

IX. BUSINESS MODEL

Turn Over:

As innovation is related to the agricultural sector, it is to be started with a huge amount of capital. Once it starts working income will be flooded. Here we act as an intermediate platform between farmers who are struggling to get enough price from the dealers and customers who are not satisfied with the quality of the product from the market. There will be no other dealers and sellers between the farmers and consumers. As all the brokerage and commissions are excluded, this will make a huge difference for us and all the rest of our competitors. This makes us money as we directly deliver the end product to the customers. The cost of selling we are offering the farmers will be 2-5 percent hiked which is our primary investment as well as public tactic. This makes them bring the product to us, and we will end having enough stock to sell. The product will be delivered by the farmers is examined and made to end products and delivered directly to the consumers by the means of the online delivery system or through local stores. The membership package is available for both farmers and customers.

Reaching Out to Customers:

1. We will be using social media platforms like Facebook and Instagram for marketing.
2. We will be conducting local campaigns and advertise our application for promotion.
3. We shall be training the farmers on digital and banking literacy so that they'll not be facing any issues regarding the usage of an application or even if they do, they'll be able to resolve it on their own.

WHY AgroDefence?

AgroDefence because we wanted to protect our agriculture sector just like defence protect our country. That was the inspiration behind our project's name.

X. RESULTS

The application inevitably serves as a platform for agricultural scientists, expertise from various other fields and most importantly the farmers who could exchange information and ideas at an elevated scale. Such exchange and broadcast of data on the latest technologies, techniques and market & weather forecasts along with the continuum of live field data captured would aid the betterment of agriculture. The full-fledged implementation of the application with all the functionalities mentioned that could be improvised over a period of time will help the farmer reduce his fatigue looking

at only a molecular level but when seen at a higher level will substantially transform the outlook of farming. Consequent impact of such a transformation on rural life would be worthwhile.

XI. CONCLUSION

We came up with this idea as nowadays everything is using technology so why not Agriculture? This application not only helps farmers with their crop growth but also helps us to make better income and believes in eliminating the suicides of farmers. AgroDefence even makes it easier for the daily consumers to get good quality farm products at a reasonable price. According to the present situation in the world when announced lockdown, none of us rushed to buy gold, land, or expensive phone. But all of us rushed to buy rice, wheat, milk, and vegetables. Farmers are the soul of the nation, Respect them.

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AUTHORS PROFILE



Harish Reddy Manyam, was currently working as a Support Analyst Of Artificial Intelligence and Analytics in Cognizant Technology Solutions. He was awarded Under Graduation in Electronics and Communication Engineering in GITAM University -2021. He was also awarded as Special Achiever from the batch of 2017-21 for his exemplary performance at various National-Level Events, consistent work ethic, and recognition of his research skills. He was also named as Domain Warrior of Microsoft's HackonAzure Challenge. He is also the top -300 finalists of the AgriIndia Hackathon. He developed theory and algorithm-based design for measurement of entertainment quotient of viewers of sports matches. He is also the top 20 finalists of T-Hub and AWS covid-19 Innovation Challenge. He's passionate about solving problems in a very underrated but also essential field is Agriculture.



Bharghava Venkata sriram, currently working as a program analyst engineer in reputed MNC. Just graduated from Gitam University as computer science engineer from the batch 2021. Carried various works regarding engineering for agriculture concept and participated in relevant competitions. Enthusiastic about the cutting-edge technologies being applied in the field of Agriculture.



Lasya Kalidindi, did her engineering with electronics and communications as her major and later went on to pursue her Post Graduate Diploma in Liberal Studies from Ashoka University. She's passionate about solving real time problems and believes that technology and business collaborations can make this possible.



Mohan sai Mangesh, currently working as a program analyst in cognizant Technology solutions. Completed his Bachelor of technology at Gitam university and graduated in the year 2021. Interested in Exploring new technologies in the field of Agriculture.



Neeraj A., is studying final year of his under graduation in the branch of computer science and engineering at Gitam University. He is a machine learning enthusiast.