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INCREASING FARMHAND INCOME THROUGH EQUIPMENT AND MACHINERY RENTING

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Abstract: Since antiquity, agriculture has been the main industry in India, providing employment for two-fifths of its population. Despite India being one of the largest producers of cash crops, a revolution is needed to raise farmer incomes and enable them to live a sustainable life. Krish-e-Hal presents itself as an alternative solution to increase their income during the off-season, when no crops are grown and hunger becomes a problem. A web portal has been set up, allowing farmers to lend and buy farming machinery and equipment, and this multilingual portal can be used easily by any farmer in any part of the country. India has a unique cropping pattern, with different parts of the state experiencing sowing season or off-season at any given time, and this pattern is being utilised in our portal to help farmers to generate an alternate source of income by lending their expensive modern farming equipment in the off-season. Our solution is beneficial for poor farmers in debt trap, providing an additional source of income to help them break out of this vicious cycle.

Index Terms - Renting Portal, Farmer equipment rental, Sustainable farming, Equipment sharing, Increasing farmers income, Web portal

1. INTRODUCTION

Farming and agriculture is the main occupation in India. 42% of the workforce has been employed in this work, which constitutes 14% of the Indian GDP. We are among the world's top wheat and rice producing countries in spite of the fact farmers are not earning the bare minimum to eat two meals in a day. The person who keeps our belly full is himself in crisis. Average monthly income of Indian farmers is 6,426 which is not enough to sustain in such ever increasing inflation. Around 70% farmer's families spend more than they earn and thus get imprisoned in the Debt trap and disguised unemployment.

Due to the heart-rending economic conditions farmers are committing suicides, the data constitutes to 7% of all suicides in the country. Day by day the economic condition of our backbone is deteriorating, in spite of various policies being implemented we are not able to recover our farmers from the ever ending debt crisis. We have to come up with an alternative way to increase their income in the season where no crop is sown or harvested, it is the time where they become helpless and hunger strike on them. Animal husbandry and overseas remittances constitute 20 - 30% as an alternative income to farmers, but it is still not sufficient enough to give our farmers a sustainable life. Ongoing USA recession and COVID period has worsened the condition.

Modern Farming equipment are very expensive, out of pocket for small village farmers but these tools can help them to increase crop size and reduce wastage of time and money. Modern Farming equipment are very expensive, out of pocket for small village farmers but these tools can help them to increase crop size and reduce wastage of time and money. Government is coming up with new schemes to double farmer's income, but is there any alternative way that can help farmers to use all modern farming tools at low cost and increase their productivity. India is a country where farming is done throughout the year, farming season can be different in different parts of the country, so if there is off season in one part then there can be a sowing period in the other part. We can take advantage of this cropping patterns and can lend farming equipment in the off season, this will generate an alternative income in off season and reduce the cost to lend and use modern technology.

Despite the fact that the cost of seeds, manures, fertilizers, and machinery is consistently rising in tandem with retail inflation, the income and sources of income for farmers remain unchanged. This income is often low in comparison to those employed in non-farming sectors. The challenge of improving the lifestyle, living conditions, and economic wellbeing of Indian farmers has been a

long-standing concern for all governments. Initiatives, such as the introduction of various schemes, programmes, and subsidies have all proven unsuccessful in achieving the desired level of parity between farmers and other sectors. This lack of income has caused a wave of young people to abandon their farming profession. The current administration also introduced the 'Double Income of Farmers by 2022' initiative to enhance the money that farmers acquire from selling their harvests. In 2015, the average monthly income of a farmer was ₹8059, which increased to ₹10218 by 2018-19. However, this is still far away from the desired target of ₹21146. To reach this goal, the government is employing various techniques such as diversification of crops, increasing crop intensity, and technological enhancement. This paper aims to evaluate methods of increasing the incomes of farmers. One way to do this is to reduce the associated upfront costs, such as the purchase of fertilizer, seed, pesticides, and the costliest element, machinery and equipment. If any of these costs can be reduced, it can have a major impact on the economic viability of farming. Thus, this research paper is concentrated on this angle of improvement plan.

II. PROBLEM IDENTIFICATION

India is known for its agriculture, which has experienced significant growth due to the introduction of agricultural machinery. However, for generations, farmers have relied on traditional methods for farming. As the years pass, more and more farmers are considering investing in mechanization to help increase their yields and reduce labour costs. However, many farmers are hesitant to make such an investment due to the large costs associated with mechanization.

The lack of mechanization in the agricultural sector has been a long-standing problem in many developing countries. This has been primarily due to the lack of capital investment from farmers, as they are often unable to afford the equipment or simply see no return on their investment. The consequences of this lack of mechanization can be seen in the slow growth and low efficiency of the agricultural sector.

Table 01: Explaining reasons for loans by various sections of farmers

Analysis between farmers' category and whether they availed loan or not with reason and their wish to hire machinery				
Farmer's category	Availed loan or not	Reason for loan	Count of reasons	Would you like to hire machinery
Small=377	Yes=179	Plantation ,fertilization	10	179
		New Machinery	127	
	No=198	Land development	42	
		Education	0	
		Not availed loan	198	
Medium=179	Yes=53	Plantation ,fertilization	0	51
		New Machinery	28	
	No=126	Land development	25	
		Education	0	
		Not availed loan	126	
Large=6	Yes=4	Plantation ,fertilization	0	2
		New Machinery	4	
	No=2	Land development	0	
		Education	0	
		Not availed loan	2	

Farmers often take loans from banks to afford such heavy equipment. This is a major factor in the farmer's high suicide rate, with his 80% of cases attributed to debt. Crop destruction during floods and rainy seasons can have a devastating economic impact on farmers, making it difficult for them to pay their loans. If farmers could rent machines for short periods instead of buying them, they could cut production costs and make their lives easier.

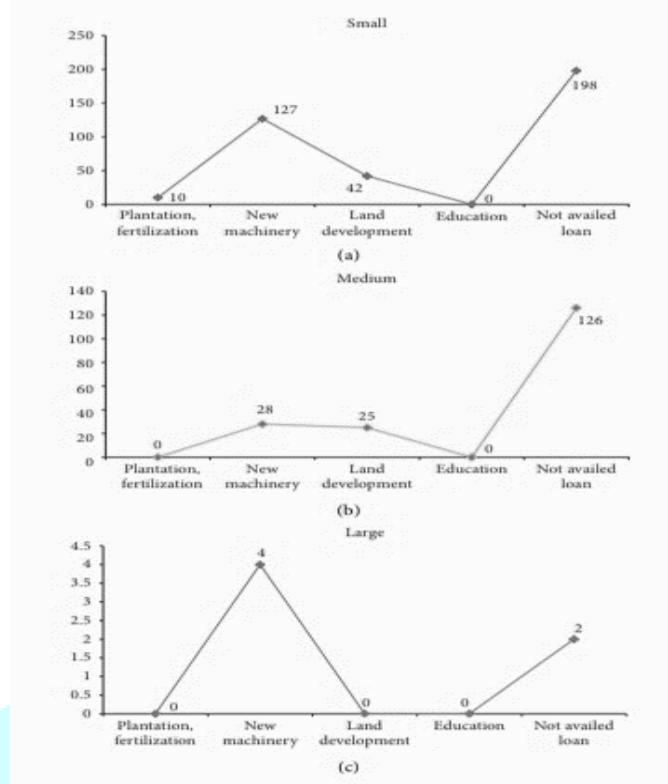


Figure 1: Reason of loans availed by farmers

The data show in above figure shows that 562 farmers were classified into three categories: small, medium and large. Of the 377 smallholder farmers, 179 are interested in getting a loan and 128 of them need a loan to rent a machine. In the middle category, 53 farmers have credit, of which 28 need credit to rent equipment. Research and analysis show that most farmers need credit to buy or rent equipment and reduce their initial investment.

III. PROBLEM STATEMENT

It is generally seen that farmer some or all equipment and machinery are idle during off seasons and are thus unused at that moment. Thus we aimed to build a platform that allows farmers to rent farming equipment for less during off season. A simple aggregation platform with call center support can function of booking equipment's will help farmers make additional income.

IV. PROBLEM SOLUTION

We have created Krish-e-Hal, a web-based platform to help farmers for renting and sharing agricultural equipment. If a farmer needs equipment, it can simply visit our platform and rent it from there. If they have tools or equipment remains idle with the farmers they can share or add it on the platform and other farmers/Workers who needs that equipment can borrow the equipment from it and the lender can make some additional sum of money. This will increase the farmer's income as well as avoid the pressure of huge loans and debts on small farmers.

The rental market for farm machinery, especially those that are inherently expensive, can improve farm mechanization in the ways:

- By increasing investment incentives for such capital goods. The return on these investments is likely to increase with the presence of the agricultural machinery rental market. Because in addition to the income from using the machines on their own farms, the owners of the excess capacity machines can get returns on investment by leasing the services of these machines.
- The farm machinery rental market can perform well for the poor farmers who cannot afford farm machinery can still realize and afford farm machinery automation by renting these machinery. Therefore, if the rental market for these, agricultural tools is established, it will benefit both the richer and economically weaker section of farmers, In fact, agricultural machinery leasing markets can play the same role as other factor markets such as water markets, and the land lease market, etc.
- By increasing agricultural production and productivity. The agricultural machinery rental market can effectively help farmers adapt to changing environments, such as difficulties in raising draft animals due to lack of pasture, frequent floods and lack of electricity. It is difficult to raise even a single cow; Smallholders usually use oxen and increasingly plows or tractors.

Considering the average farm size of, farms in the state and the size of marginal small farmers, it is estimated that the farm machinery rental market can play an important role in improving the level of agricultural mechanization and global development of agriculture. The study covers several aspects of agricultural equipment leasing markets such as the extent of these markets, the impact of these

markets on agricultural mechanization, production and productivity, the structure and determinants of rental rates and the effect of credit in these markets.

However, some aspects of agricultural capital commodity rental markets are not covered, such as the form of these markets and the determinants of participation in them. In addition, the impact of the agricultural and irrigation machinery rental market on agricultural production and the intensity of use of machines may also play an important role. Its role in the adoption of productivity practices in the country. Therefore, there are still gaps in the agricultural equipment rental market research.

Therefore, in order to bridge the research gap, this study aims to examine the shape of rental markets, the factors affecting participation in these markets and their impact on agricultural production and land improvement practices.

V. IMPLEMENTATION

Krish-e-Hal is a Web portal that works on real time interaction with the users. The frontend of the project is made using React JS and the backend work is handled using Firebase and Django. It uses various API calls to handle various user requests.

5.1 Features and components

The various features and components that are used in the portal are as follows:

- Home page of the website, with a beautiful and well organized user interface.
- Registration system that uses either email id or mobile number to register a user. Only registered user can book or add products.
- Login system and user authentication system which uses OTP to confirm if right person is trying to login and give provide him the permission he is permitted for the role he login.
- Dashboard which has all the products that a user add that are available for rent.
- Help feature and FAQ page that has some pre answered questions regarding the site and its usage.
- Add Product page is also built already. It has a form with various specifications of the product and image which can be used to add product to the site.
- Multilingual Feature Users can visit and see the content of site in any of the languages supported by google text recognition system thus supports more than 50 languages.

5.2 Functional and Non Functional Requirements

The various functional requirements for the system are:

- The ability for farmers to search for available tools to rent
- The ability for farmers to reserve or rent tools
- The ability for farmers to view their rental history and current rentals
- The ability for the system to process payments and keep track of financial transactions
- The ability for the system to send notifications to farmers regarding their rentals (e.g. when a rental period is approaching its end, when a rental has been returned, payment due date)
- The ability for farmers to leave reviews of tools they have rented
- The ability for administrators to manage the inventory of tools available for rent, including adding or removing tools and editing tool information
- The ability for farmers to filter search results by tool type, brand, location, etc.

The various non- functional requirements for the system are:

- The system must be available 24/7 with an as minimum downtime as possible.
- The system must be able to handle a high volume of concurrent users at any period of day.
- The system must be secure and protect sensitive user data of users specially the payment details.
- The system must be accessible from all the user devices whether mobile or stationary.
- The system must be easy to use and understand for farmers with a lesser literacy rate.
- the system should be very fast and have a response time of less than 2 seconds to any query
- The system should be scalable, and should be able to handle increasing number of farmers over time.
- The system should be accessible in rural areas with low internet connectivity

5.3 Flow chart

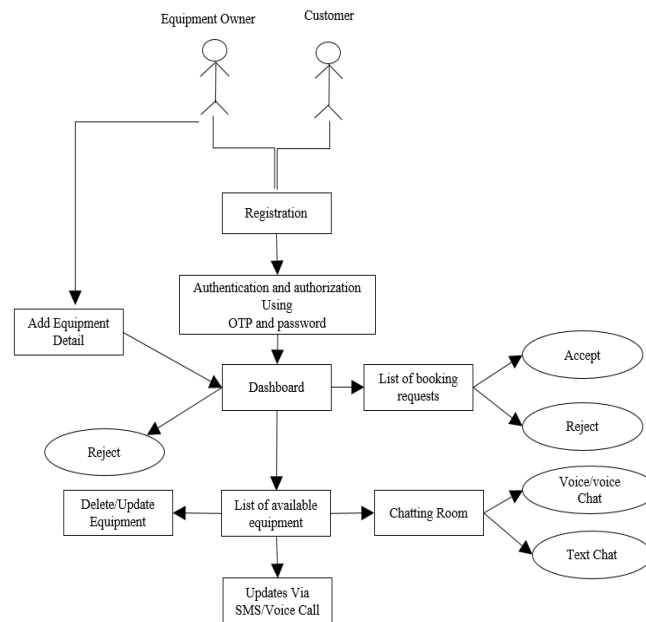


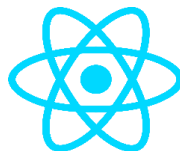
Fig 1.Flow Diagram

The above Diagram explains the flow of our web portal. A User when he visits the site for the very first time can visit the site and see the equipment available for rent but he will have to register and verify his identity before he can rent out or even put something on rent on the website. Once he login after registering he will land on the main dashboard which will have all the equipment details and can directly book it from there. On the home page there are various others page links and features that the user can visit and use. There a user can also find a chat system available through which various queries can be resolved through a chat AI bot or a text chat.

VI. TECHNOLOGY USED

React is a JavaScript library for building user interface. React implements one-way reactive data flow, which reduces the boilerplate and is easier to reason about than traditional data binding. It has been used as front-end development technology in the application.

React allows us to create various different reusable components that are included in our application such as home, registration, login, dashboard, profile edit, help feature and FAQ and add product.



As some of the users might not be educated, so to make it easy for them we use a multi-language feature on our website using i18nexus API to convert all text into the language of their choice. i18nexus is supported by Google Translate, which automatically changes the text to the desired language.



We are using an IVR on our website using C# to embed high quality and responsive voice calls. An IVR is an automated telephone system that allows callers to access information about pre-recorded messages.

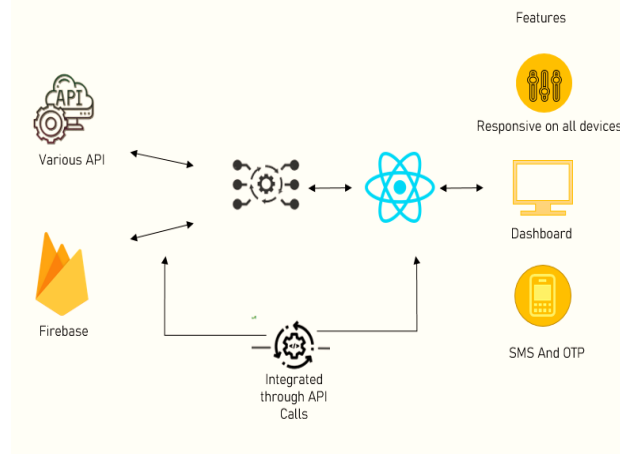


Figure: Technology Stack Used

Our development team has implemented Firebase integration for backend data storage. Firebase is a NoSQL database, meaning that all data is stored in key-value pairs. We have also integrated Google authentication for user logins and implemented email validation checks. Upon successful authentication, users are now able to add equipment details which are stored in an object and accessed on the frontend through an API request to Firebase storage.



VII. OUTCOME

Krish-e-Hal is a revolutionary platform created to help small and medium scale farmers in India. 70% of people in India depend on agriculture and many come from humble backgrounds. To make farming easier and more affordable, we've created a web-based renting and sharing equipment platform. Farmers can register and rent the equipment listed on the platform. They can also list any idle or unused equipment and make extra money. Our platform is secure and safe with mobile verification. With Krish-e-Hal, farmers can make their lives easier and boost their economic status. Let's build a rental ecosystem that benefits all farmers around the country!

VIII. RELATED WORKS

Some large companies have made attempts to address a similar issue recently. *Mahindra & Mahindra Limited* launched the Krish-e application in 2020, which offers a variety of services to farmers via its mobile application. These services include farm consultation, crop diversification techniques, and personal advice. One component of this app is the rental feature known as 'Krish-e Rental Partner App' which allows larger partners to lend out heavy machinery through the portal.

A paper, titled 'Efficient Farming – Hiring Equipment for Farmers' by B. JothiJahnavi, R. Monica, and N. Supriya, examined a similar problem. They created a mobile application that focuses on renting tractors and other machinery. The application includes a feature that informs farmers of the market rate of equipment. Their project was developed using JetBrains' IntelliJ IDEA software. Their goal is to make their product a free renting service.

A research on 'Metaheuristic and Machine Learning-Based Smart Engine for Renting and Sharing of Agriculture Equipment' by Manik Rakhra, Ramandeep Singh, Tarun Kumar Lohani and Mohammad Shabaz have conducted a survey of 562 farmers and found that many of them struggle with debt due to the unaffordable cost of new machinery. In response, the researchers have developed and launched an Internet-based mobile application that allows farmers to advertise, reserve, rent, and share agricultural equipment. This e-marketplace will give farmers the opportunity to build their businesses and upgrade their knowledge.

A paper titled "Web based form equipment rental system for Agriculture" has been published in IJCRT by M Nagendra Raju, Dr T Manikumar, Dr N Naveen kumar. They have created a platform to help farmers rent agricultural machinery such as Tractors, JCBs, harvesters and rotors at an affordable rate. The goal is to provide assistance to economically disadvantaged farmers who cannot afford to purchase all the necessary equipment.

A paper titled 'Agri-Equipments Rental System' by Bhuvan S, Purushotham G.K, Manoj A, Chandan A.M, Chandraprabha K.S. to help farmers rent agriculture machinery more easily. This application can check the availability of equipment and offers advanced

booking, as well as tracking of rented equipment. The goal of this project is to reduce manual work, save time, and create a sustainable environment.

Anuradha A., Bhavana J. Musale, Mrunali T. Nanaware³, and Priti R. conducted research and produced a paper titled 'Farm equipment rental system'. The aim of the research was to create a portal that would allow farmers to lend out their equipment and machinery to others in the off-season. The portal was designed to be user friendly, offering increased profitability and reduced time and effort for farmers. Furthermore, the portal provides access to all necessary information for future use.

Chella Ashok Kumar and Dr. M. Saravanamuthu present a research paper titled 'AGRARYANS: Farm Equipment Rental System/Based on Agriculture'. This study explores the concept of machinery rental and the impact of the E-commerce portal in bridging the gap between farmers and vendors. It proposes a solution to provide low-cost rental services for farmers, thus generating an alternative source of income during off season.

IX. ENHANCEMENTS ADDED

From our comprehensive literature review of other journals and the already developed models, we concluded that the majority of them were built on e-commerce model of renting. Unfortunately, they failed to recognize their target consumer base. All the models prepared earlier lacked a feature to assist the uneducated class, not taking into consideration that for small farmers, understanding and utilizing technology, especially in an unfamiliar language, would be difficult.

Our multilingual feature, which renders all content in the user's preferred language, will act as a trust bridge for the uneducated class, who may not otherwise understand what they're doing on the portal. This is especially important in India, where language can vary from state to state and even from district to district. With this feature, users can easily translate equipment names and descriptions to ensure a complete understanding, eliminating any potential for misunderstanding.

The Interactive voice response (IVR) i.e., keypad booking system is an effective method to help farmers access the equipment they need. It is designed to be user-friendly for those without an extensive knowledge of technology. The process is similar to how people book gas cylinders over the phone – the user is presented with a range of tools to choose from and can drill down further to find the relevant item. If the desired equipment is available, the IVR system can connect the farmer to all possible people who may be able to provide it. The business model for this system is a small up-front fee.

Our portal is designed to provide a comprehensive user experience. It features a streamlined user interface and pre-answered queries, as well as an advanced chat bot powered by artificial intelligence to help with pre-answered questions and unsolved solutions that can't be found in existing models. Thus Our model has been thoroughly researched and developed to ensure we deliver the best possible solutions to the users. Thusly, our model despite everything give an unsolved arrangement over as of now explored created models and furthermore acquire an exceptional space in a now known territory of research.

X. CONCLUSION

Our research shows that farmers need more equipment to increase production and profits. Unfortunately, many farmers are forced to take out loans to buy expensive machineries. That's why we offer a platform where they can share and rent equipment, a platform to save money for some and for others a chance to increase their income. Plus, we provide special features such as multi-language support and mobile verification for security. Ultimately, our goal is to make farmer's businesses stable and sustainable. Research and data support our product.

XI. FUTURE SCOPE OF WORK

We are looking to develop a Speech Recognition system or speech-to-text which will allow us to process human speech into a written format. In order to make our small and medium farmers, who come from rural areas with limited access to technology, more comfortable, we will incorporate speech recognition software, which will make our website more user-friendly and efficient.

We will also be creating a dispute resolution system, as our system is already transparent, but in any case of a dispute regarding a product or payment, we will develop a mechanism that will allow both parties to resolve their issues on our platform. Furthermore, we will introduce a chat bot that will be able to simulate human-like conversations with users via text messages on chat. This will make our website more interactive and engaging for our users.

We, together with the booking system, are committed to building a strong relationship between the farmers and providing them with easy access to machinery. In our future plan we will add a chat feature that will make it easier for the two parties to communicate maybe convince a different rate of charge and ensure smooth transactions. As we move forward, we plan to expand the scope of our services to include additional features that will further benefit the farmers.

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