

KrishiUrja – Sustainable Agriculture in Maharashtra

*Project Report submitted
in
Partial fulfilment of requirement for the award of degree of*

Bachelor of Technology in Computer Engineering

by

Ms. Akanksha Padgilwar

Ms. Kajal Katheriya

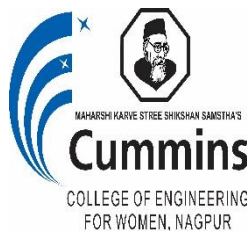
Ms. Siddhika Mundada

Guide

**Prof. Sharayu Deote
Assistant Professor**

Department of Computer Engineering

**Department of Computer Engineering
Cummins College of Engineering for Women, Nagpur**



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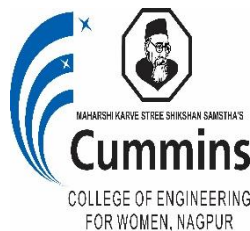
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April 2024

DECLARATION

We, hereby declare that the project report titled “KrishiUrja – Sustainable Agriculture in Maharashtra” submitted here in has been carried out by us towards partial fulfilment of requirement for the award of Degree of Bachelor of Technology in Computer Engineering. The work is original and has not been submitted earlier as a whole or in part for the award of any degree / diploma at this or any other Institution / University.

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Name of Student	Mobile No	Mail ID	Signature
Akanksha Padgilwar	9511713900	padgilwarakanksha123@gmail.com	
Kajal Katheriya	8177840633	kajalkatheriya0000@gmail.com	
Siddhika Mundada	9370876142	mundadasiddhika@gmail.com	

Place: -

Date: -

Certificate

The project report entitled as “**KrishiUrja - Sustainable Agriculture in Maharashtra**” submitted by **Akanksha Padgilwar, Kajal Katheriya and Siddhika Mundada** for the award of Degree of Bachelor of Technology in Computer Engineering has been carried out under our supervision. The work is comprehensive, complete and fit for evaluation.

Prof. Sharayu Deote
Guide
Assistant Professor
Department of Computer Engineering
C C O E W, Nagpur

Prof. A. R. Welekar
Project Incharge
Assistant Professor
Department of Computer Engineering
C C O E W, Nagpur

Prof. Sharayu Deote
Head of Department
Department of Computer Engineering
C C O E W, Nagpur

Dr. Milind Khanapurkar
Principal
C C O E W, Nagpur

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Ms. Akanksha Padgilwar(8CE01)

Ms. Kajal Katheriya(8CE22)

Ms. Siddhika Mundada(8CE62)

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ABSTRACT

This project endeavours to rejuvenate Maharashtra's agricultural sector, with a primary focus on uplifting farmers' livelihoods through a multifaceted strategy. Our approach entails the introduction of modern agricultural machinery, available for rent, aimed at streamlining cultivation and harvesting processes for enhanced efficiency. Complementing this effort is the establishment of an information dissemination system, providing farmers with essential data on crop rates, weather forecasts, and available government schemes. Armed with this knowledge, farmers can make informed decisions regarding crop sales, optimal planting times, and risk mitigation strategies in light of unpredictable weather patterns.

Furthermore, the project aims to promote the adoption of climate-resilient farming practices and crop diversification, supported by targeted training programs for skill enhancement and the advocacy of sustainable agricultural methods. By addressing critical challenges such as irrigation, access to credit, and market intelligence, the initiative aims to boost agricultural productivity, elevate farmers' incomes, and fortify food security throughout Maharashtra. Essential to the project's success is collaborative engagement with governmental agencies, local communities, and technology providers, fostering a unified approach towards revitalizing and sustaining Maharashtra's agricultural landscape.

CHAPTER – 1

INTRODUCTION

CHAPTER 1**Introduction**

In the vast agricultural landscape of India, where agriculture is not just a livelihood but a way of life, farmers grapple with a myriad of challenges ranging from unpredictable weather patterns to access to modern machinery and market uncertainties. In the face of these challenges, the need for innovative solutions that empower farmers and enhance agricultural productivity has never been more pressing. It is within this context that KrishiUrja emerges as a beacon of hope, offering a transformative platform poised to revolutionize traditional farming practices and uplift the agricultural community across India.

The agricultural sector in India is characterized by its diversity, with millions of small and marginal farmers contributing significantly to the nation's food security and economy. However, these farmers often find themselves at the mercy of nature, struggling to cope with erratic weather conditions that can decimate crops and livelihoods overnight. From droughts to floods, the unpredictability of weather patterns poses a constant threat to agricultural sustainability and food security.

Furthermore, access to modern agricultural machinery remains a daunting challenge for many farmers, particularly those in remote and marginalized regions. The high cost of purchasing machinery coupled with limited availability exacerbates the already existing disparities in agricultural productivity. As a result, small-scale farmers are often forced to rely on manual labour, leading to inefficiencies and decreased yields.

In addition to weather-related uncertainties and limited access to machinery, Indian farmers also grapple with market volatility and lack of information regarding crop prices and government schemes. Fluctuating market prices can significantly impact farmers' incomes, making it difficult for them to plan and invest in their crops effectively. Moreover, the complex landscape of government schemes and subsidies often leaves farmers bewildered, struggling to navigate bureaucratic hurdles to avail the benefits they are entitled to.

Against this backdrop of challenges, KrishiUrja emerges as a game-changer, offering a comprehensive solution tailored to the unique needs of Indian farmers. By harnessing the power of technology, KrishiUrja aims to bridge the gap between traditional farming practices and modern innovations, empowering farmers with the tools and resources they need to thrive in an increasingly uncertain environment.

Through its innovative platform, KrishiUrja seeks to provide Indian farmers with access to crucial resources such as weather forecasts, modern machinery, market intelligence, and information on government schemes—all in one centralized hub. By equipping farmers with real-time meteorological insights, facilitating access to cost-effective machinery, and providing market information and scheme facilitation, KrishiUrja endeavours to empower Indian farmers to make informed decisions, enhance productivity, and secure their livelihoods.

In essence, KrishiUrja represents not just a technological innovation but a beacon of hope for millions of Indian farmers, promising to usher in a new era of agricultural prosperity and sustainability. As we embark on this transformative journey, let us join hands to empower Indian farmers and build a brighter future for agriculture in India.

Moreover, KrishiUrja is not just about providing immediate solutions to the challenges faced by farmers; it's about fostering a culture of continuous learning and adaptation. By facilitating access to training programs and agricultural extension services, KrishiUrja empowers farmers to stay updated with the latest farming techniques, innovations, and best practices. This emphasis on knowledge transfer ensures that farmers are equipped not only to overcome existing challenges but also to anticipate and adapt to future changes in the agricultural landscape. By promoting a culture of innovation and resilience, KrishiUrja not only uplifts individual farmers but also contributes to the overall advancement and sustainability of India's agricultural sector.

CHAPTER-2

LITERATURE REVIEW

Literature Review

Kumar P, 2018, Agricultural Challenges in India: A Comprehensive Review.

Agriculture in India faces a myriad of challenges that impact productivity, sustainability, and farmer livelihoods. These challenges are multifaceted and require holistic solutions to ensure the growth and development of the agricultural sector. Some of the key challenges include:

- i. **Water Scarcity:** India's agriculture is heavily dependent on monsoon rains, making it vulnerable to water scarcity. Inefficient water management practices exacerbate this issue, leading to crop failures and reduced yields.
- ii. **Land Degradation:** Soil erosion, salinity, and depletion of nutrients are major concerns in Indian agriculture. Continuous cultivation without proper soil conservation measures has led to decreased soil fertility and productivity.
- iii. **Lack of Mechanization:** The majority of Indian farmers still rely on traditional methods of farming, leading to low efficiency and productivity. The lack of access to modern agricultural machinery hinders progress in the sector.
- iv. **Market Access:** Farmers often face challenges in accessing markets for their produce. Lack of proper infrastructure, storage facilities, and market information leads to exploitation by middlemen and low returns for farmers.
- v. **Climate Change:** Erratic weather patterns, increasing temperatures, and unpredictable rainfall due to climate change pose significant risks to agriculture in India. Farmers struggle to adapt to these changing conditions.
- vi. **Pests and Disease:** Outbreaks of pests and diseases threaten crop yields, leading to significant losses for farmers. Limited access to quality pesticides and healthcare services further compounds this issue.
- vii. **Policy and Institutional Constraints:** Inadequate support from government policies, lack of credit facilities, and limited extension services hinder the growth of the agricultural sector in India.

Auffhammer, M. A., 2022, Impact of Weather Variability on Indian Agriculture.

The impact of weather variability on Indian agriculture has been a subject of extensive research in recent years. Climate change has led to increasingly severe weather patterns, which have had a negative impact on agricultural productivity. In India, temperature and

precipitation are major drivers of crop yields, and fluctuations in these variables have been found to affect land use and the location of crop production.

Studies have shown that temperature and precipitation fluctuations can lead to changes in farmers' crop mixes and irrigation practices. For example, farmers may diversify their crops in years with greater temperature fluctuations or increase irrigation in response to heat shocks. Prior research has also found that temperature and precipitation are significant drivers of land use changes and crop production shifts, both within and across regions in India.

The impact of weather variability on agriculture is not limited to crop production. It also affects other agricultural sectors, such as horticulture, livestock, poultry, fish, and apiculture. For example, climate change can alter the physiological functions of horticultural crops, leading to changes in phenology, crop duration, and yield.

Adaptation strategies, such as crop diversification, can help mitigate the impact of weather variability on agriculture. However, the effectiveness of these strategies may be limited in India, where there are no significant intra- or inter-regional shifts in crop production in response to rising temperature.

In conclusion, weather variability has a significant impact on Indian agriculture, affecting crop yields, land use, and other agricultural sectors. Climate change is expected to result in decreased freshwater availability and increased crop water demand, making it essential to understand crop water requirements and current water supplies to manage available resources better. Adaptation strategies, such as crop diversification, can help mitigate the impact of weather variability, but their effectiveness may be limited in India.

Tamiru Lemi, 2019, Effects of Climate Change Variability on Agricultural Productivity.

Globally, climate change is a challenge facing humans and their socio-economic activities, health, livelihood, and food security and is the most serious threat that adversely affects agricultural productivity; it will influence temperature and rainfall. The objective this review is to assess the effect of climate change and variability on agriculture. To achieve this objective different literature from different sources were collected, organized and summarized carefully. Even though, it is global problem, developing countries like Africa,

are the most adversely affected by climate change due to low level adaptive capabilities of the countries. Climate change and agriculture are inextricably linked. Agriculture still depends fundamentally on the weather. In many parts of the world climate change has already caused a negative impact on agriculture, because of increasingly severe weather patterns. Similarly, year to year crop production substantially influenced by Climate variability even in high yield and high-technology agricultural areas. Its impacts on agriculture have significant consequences on livelihoods, food production, and the overall economy of countries, particularly those with agriculture-based economies in the developing world by affecting crop production, livestock productivity, horticultural crops, aquaculture (fish production), apiculture. It is expected to continue to cause floods, worsen desertification and disrupt growing seasons.

Keywords: Adaptive capacity; Susceptibility; Livestock; Aquaculture; Apiculture; Crop production; Global warming

Shivani Kumari, 2020, A Review on Climate Change and its Impact on Agriculture in India.

Agriculture sector is of the utmost importance to the economy of a country and incidentally it is also most vulnerable to global climate change. Climate change is taking a toll on India's agricultural production and productivity. Intergovernmental panel on climate change (IPCC) has projected that by the end of 21st century temperature in India is likely to increase by 3-4°C which would lead to a loss of 3-26% in net agricultural revenues. Aggravated climatic factors will ultimately decline plant productivity, which will result in increased prices and unaffordable rates for the common population. The absence of mitigation and adaptation measures may result in lower farm income by 12-40% in the coming years. This issue is an important concern for livelihood, economic development and ensuring food and job security of an agrarian nation like India. The causes that ultimately are contributing to increase in greenhouse gases, deterioration of soil and water ecology must be identified and rectified. Crop productivity in the countries of southern hemisphere is expected to decrease by as much as 20 per cent, with less developed countries suffering the greatest negative effects according to IPCC report 2007. Hence, adaptation to current agricultural scenario must be undertaken at once to avoid the risks incurred and tackle complications arising due to global climate change. How quickly Indian farmers are able to adjust in their farming practices to adapt to climate change and what policies or technologies will enable rapid adaptation are

issues that merit attention of everyone. However, a rapid adaptation is less possible in a developing country like India, where availability to information and capital is limited among the majority of farmers.

Zhihong Xu, 2023, Market Dynamics and Price Volatility in Indian Agriculture.

Agricultural extension plays a crucial role in disseminating knowledge, empowering farmers, and advancing agricultural development. The effectiveness of these roles can be greatly improved by integrating technology. These technologies, often grouped into two categories—agricultural technology and educational technology—work together to yield the best outcomes. While several studies have been conducted using technologies in agricultural extension programs, no previous reviews have solely examined the impact of these technologies in agricultural extension, and this leaves a significant knowledge gap especially for professionals in this field. For this scoping review, we searched the five most relevant, reliable, and comprehensive databases (CAB Abstracts (Ovid), AGRICOLA (EBSCO), ERIC (EBSCO), Education Source (EBSCO), and Web of Science Core Collection) for articles focused on the use of technology for training farmers in agricultural extension settings. Fifty-four studies published between 2000 and 2022 on the use of technology in agricultural extension programs were included in this review. Our findings show that:

- i. Most studies were conducted in the last seven years (2016–2022) in the field of agronomy, with India being the most frequent country and Africa being the most notable region for the studies;
- ii. The quantitative research method was the most employed, while most of the included studies used more than one data collection approach;
- iii. Multimedia was the most widely used educational technology, while most of the studies combined more than one agricultural technology such as pest and disease control, crop cultivation and harvesting practices;
- iv. The impacts of technology in agricultural extension were mostly mixed, while only the educational technology type had a statistically significant effect or impact of the intervention outcome. From an analysis of the results, we identified potential limitations in included studies' methodology and reporting that should be considered in the future like the need to further analyse the specific interactions between the two technology types and their impacts of some aspects of agricultural extension. We

also looked at the characteristics of interventions, the impact of technology on agricultural extension programs, and current and future trends. We emphasized the gaps in the literature that need to be addressed.

Shoaib Farooq, 2020, Role of IoT Technology in Agriculture: A Systematic Literature Review.

The growing demand for food in terms of quality and quantity has increased the need for industrialization and intensification in the agriculture field. Internet of Things (IoT) is a highly promising technology that is offering many innovative solutions to modernize the agriculture sector. Research institutions and scientific groups are continuously working to deliver solutions and products using IoT to address different domains of agriculture. This paper presents a systematic literature review (SLR) by conducting a survey of IoT technologies and their current utilization in different application domains of the agriculture sector. The underlying SLR has been compiled by reviewing research articles published in well-reputed venues between 2006 and 2019. A total of 67 papers were carefully selected through a systematic process and classified accordingly. The primary objective of this systematic study is the collection of all relevant research on IoT agricultural applications, sensors/devices, communication protocols, and network types. Furthermore, it also discusses the main issues and challenges that are being investigated in the field of agriculture. Moreover, an IoT agriculture framework has been presented that contextualizes the representation of a wide range of current solutions in the field of agriculture. Similarly, country policies for IoT-based agriculture have also been presented. Lastly, open issues and challenges have been presented to provide the researchers promising future directions in the domain of IoT agriculture.

Brian Bothwell, 2024, Benefits and Challenges for Technology Adoption and Use.

Precision agriculture involves collecting, analysing, and taking actions based on data. It can help the agricultural sector meet increasing demand for food products, while also helping farmers improve efficiencies such as through reduced input costs.

The Advancing IoT for Precision Agriculture Act of 2021, contained in what is commonly referred to as the CHIPS and Science Act of 2022, included provisions for GAO to conduct a technology assessment and review federal programs.

This report examines (1) emerging precision agriculture technologies and precision agriculture technology adoption; (2) federal programs providing support for precision agriculture; (3) benefits and challenges of adopting and using precision agriculture technologies; and (4) policy options that could address challenges or help enhance benefits of adopting and using precision agriculture technologies.

To conduct this technology assessment and review, GAO reviewed scientific literature and other key reports; interviewed officials and representatives from government, industry, academia, and associations; conducted two site visits to observe technology operations and obtain stakeholder perspectives; and convened a 3-day virtual expert meeting in collaboration with the National Academies of Sciences, Engineering, and Medicine. GAO is identifying policy options in this report.

Marcelo Werneck Barbosa, 2024, Government Support Mechanisms for Sustainable Agriculture: A Systematic Literature Review and Future Research Agenda.

Government support for enterprises can be provided in different forms, such as subsidies, tax incentives, or direct public investment. Government support can also be given to develop environmentally and socially responsible initiatives. In the agriculture sector, government support involves providing early-warning information from meteorological monitoring, policies to encourage companies and citizens to engage in sustainable behaviour, and the organization of disaster relief activities. A comprehensive view of the government support mechanisms employed in the agriculture industry and their possible effects on the adoption of sustainable initiatives is yet to be provided in the literature. Through a systematic literature review of articles published from 1992 to 2023 in the Web of Science and Scopus databases, this study found that subsidies, programs, regulations, and financial assistance are the main mechanisms used by governments to support sustainable initiatives in agriculture. Moreover, our review also found that the reduction in environmental impacts, the stimulus to organic production, industry growth, and rural development are the most common goals of using government support for sustainable agriculture. We also geographically categorize research in this field by showing where research has been produced and where it should be improved. We call for more research focused on support from governments in South America. We also observed that environmental protection, the supply of organic foods, and urban agriculture are frequently impacted when there is not

enough government support. At last, we propose some research questions to guide future studies. We expect that policymakers will use the outcomes of this study to guide the design and implementation of new government support mechanisms aimed at improving the sustainable performance of agriculture firms. The outcomes of this study will also help managers make investment decisions.

Keywords: government-support, sustainable-agriculture, sustainability, institutional-theory, agri-food supply chains

Lina M Bastidas-Orrego, 2023, A systematic review of the evaluation of agricultural policies.

The food security of each country depends on agricultural development, which is sensitive to the implementation of agricultural public policies. These must evolve as new ruralities arise, with new phenomena, such as climate change, ecosystem services, changes in consumer preferences, globalization, sustainability and ecological awareness. Hence, of ex-ante and ex-post evaluations of agricultural policies, are important because they provide timely information to government entities. There are different methodologies for policy evaluation, which have evolved over time.

Raphael Lencucha, 2020, Government policy and agricultural production.

Unhealthy foods and tobacco remain the leading causes of non-communicable disease (NCDs). These are key agricultural commodities for many countries, and NCD prevention policy needs to consider how to influence production towards healthier options. There has been little scholarship to bridge the agriculture with the public health literature that seeks to address the supply of healthy commodities. This scoping review synthesizes the literature on government agricultural policy and production in order to 1) present a typology of policies used to influence agricultural production, 2) to provide a preliminary overview of the ways that impact is assessed in this literature, and 3) to bring this literature into conversation with the literature on food and tobacco supply.

This review analyses the literature on government agricultural policy and production. Articles written in English and published between January 1997 and April 2018 (20-year range) were included. Only quantitative evaluations were included. Studies that collected

qualitative data to supplement the quantitative analysis were also included. One hundred and three articles were included for data extraction. The following information was extracted: article details (e.g., author, title, journal), policy details (e.g., policy tools, goals, context), methods used to evaluate the policy (e.g., outcomes evaluated, sample size, limitations), and study findings. Fifty-four studies examined the impact of policy on agricultural production.

The remaining articles assessed land allocation ($n = 25$) (e.g., crop diversification, acreage expansion), efficiency ($n = 23$), rates of employment including on- and off-farm employment ($n = 18$), and farm income ($n = 17$) among others. Input supports, output supports and technical support had an impact on production, income and other outcomes. Although there were important exceptions, largely attributed to farm level allocation of labour or resources. Financial supports were most commonly evaluated including cash subsidies, credit, and tax benefits. This type of support resulted in an equal number of studies reporting increased production as those with no effects.

This review provides initial extrapolative insights from the general literature on the impact of government policies on agricultural production. This review can inform dialogue between the health and agricultural sector and evaluative research on policy for alternatives to tobacco production and unhealthy food supply.

Keywords: Non-communicable disease, Food policy, Agriculture, Review, Tobacco, Tobacco control, Global health policy

Noor ul Islam Wani, 2017, Information and Communication Technology in Agriculture: A Kashmir Perspective.

Agriculture is the mainstay of our economy as about 70% of the population directly or indirectly is associated with agriculture and allied activities. However, agriculture in Kashmir is continuously facing tremendous constraints in the form of poor institutional arrangements, inefficient extension services, geographical constraints and also the vagaries of the nature. However, in the present era wherein the economy of the farmer is the prime concern, it is the moral duty of all respected parties who are engaged in research, extension and development activities to come forward and work for increasing the net returns of the farmers on sustainable basis. Under prevailing situation, it is quite difficult for the extension workers to cover most of the farmers in face to face mechanism for

information of technological interventions and thereby adoption of these technologies. Hence, there seems to be no immediate solution but to go for ICT. This paper focusses on various issues, constraints and prospects of ICT with respect to agriculture and allied sectors particularly in the context of J&K state.

Noor ul Islam Wani, 2022, Adoption of ICT innovations in the agriculture sector in Africa.

According to the latest World Economic Forum report, about 70% of the African population depends on agriculture for their livelihood. This makes agriculture a critical sector within the African continent. Nonetheless, agricultural productivity is low and food insecurity is still a challenge. This has in recent years led to several initiatives in using ICT to improve agriculture productivity. However, a systematic review of the evidence categorized by the various aspects of the topic is lacking. This study investigates the state of the art of ICT innovations within the agriculture sector in Africa. To achieve this, we reviewed the literature published from 2010 to 2019 in which ICT innovations were discussed. Our search in four major literature databases yielded 779 papers, of which we selected 23 primary studies for a detailed analysis. The analysis shows that the main ICT technologies adopted are text and voice-based services targeting mobile phones. The analysis also shows that radios are still widely used in disseminating agriculture information to rural farmers, while computers are mainly used by researchers. Though the mobile-based services were aimed at improving access to accurate and timely agriculture information, the literature review indicates that the adoption of the services is constrained by poor technological infrastructure, inappropriate ICT policies, and low level of user skills, especially of farmers, in using the technologies.

Haki Pamuk, 2022, Community-based approaches to support the anchoring of climate-smart agriculture in Tanzania.

We assess the impact of community-based approaches to promote adoption of integrated climate smart agriculture (CSA) practices based on soybean cultivation combined with mulching, intercropping, crop rotation, manure application and rhizobium inoculation methods. We use quasi-experimental data of farmers participating in Farmer Field Business Schools (FFBS) and Village Savings and Loan Associations (VSLAs) in Iringa region of

Tanzania. Farmers received technical training and financial support for the initial adoption of soybean production, and women's empowerment supported household's continuous involvement in CSA practices. We find a positive effect for farmers participating in the trainings provided by the FFBSs and receiving microfinance services from VLSA members on the adoption rates of several CSA practices, and this effect became more pronounced for households with higher scores on women empowerment. Farm-level improvement in soybean production and market-level incentives for soybean sales should also strengthen household income, consumption and nutrition levels to maintain CSA practices. Community-based platforms create critical external conditions for introducing CSA practices, but women's empowerment is indispensable for intrinsic incentives for anchoring their adoption

CHAPTER-3

PROPOSED METHODOLOGY

CHAPTER 3**Proposed Methodology**

The methodology proposed for the implementation of the KrishiUrja project encompasses a systematic approach aimed at developing, deploying, and evaluating the four main modules: Renting, Weather, Rates, and Scheme. Each module will undergo rigorous development and testing phases to ensure functionality, usability, and effectiveness in meeting the needs of the target users, primarily small and marginal farmers across India.

1. Module Development:

The development process will begin with comprehensive requirements gathering through stakeholder consultations, user surveys, and domain expert inputs. Based on the identified needs and preferences of farmers, each module will be designed with a user-centric approach, focusing on simplicity, accessibility, and intuitive navigation. Prototypes and wireframes will be created to visualize the user interface and gather feedback for iterative refinement.

2. Renting Module:

The Renting module will involve the creation of a digital platform where farmers can browse, select, and rent agricultural machinery from a curated list of available options. The development team will collaborate with machinery vendors, rental agencies, and agricultural equipment manufacturers to onboard their inventory onto the platform. Integration with payment gateways and logistics partners will facilitate seamless transactions and delivery of rented equipment to farmers' doorsteps.

3. Weather Module:

The Weather module will leverage real-time data feeds from meteorological agencies and weather forecasting services to provide farmers with accurate and up-to-date weather information. The development team will implement algorithms for processing weather data and generating forecasts at various temporal and spatial resolutions. User-friendly interfaces

will allow farmers to access current, hourly, and weekly weather reports, along with personalized alerts for adverse weather events.

4. Rates Module:

The Rates module will aggregate market intelligence on crop prices from different towns and regions, enabling farmers to make informed decisions regarding crop selection, cultivation, and marketing strategies. Data sources such as agricultural markets, commodity exchanges, and government price databases will be integrated to provide comprehensive coverage of crop price trends. Visualizations and analytics tools will aid farmers in analysing price variations and identifying profitable opportunities.

5. Scheme Module:

The Scheme module will serve as a repository of government and private sector schemes aimed at supporting agricultural development and empowering farmers. The development team will curate information on various schemes, subsidies, grants, and financial assistance programs available to farmers. User-friendly interfaces will enable farmers to search, filter, and apply for schemes based on eligibility criteria, geographical location, and thematic areas.

6. Testing and Evaluation:

Each module will undergo rigorous testing, including functional testing, usability testing, and performance testing, to ensure reliability, stability, and compatibility across different devices and platforms. Feedback from pilot deployments and user trials will be incorporated into iterative refinements to enhance user experience and address any identified issues or shortcomings.

Conclusion

In conclusion, the proposed methodology for the KrishiUrja project encompasses a holistic approach to module development, implementation, and evaluation, guided by user-centric

design principles and stakeholder engagement. By leveraging technology to address the diverse needs of farmers, KrishiUrja aims to empower them with the tools and resources they need to thrive in an increasingly dynamic agricultural landscape.

CHAPTER-4

**DATA COLLECTION/ TOOLS/
PLATFORMS USED**

CHAPTER 4**Data Collection/ Tools/ Platforms Used****Firebase Firestore for Data Collection and Storage:**

Use Firestore collections to store different types of data relevant to your project, such as user information, crop details, sensor readings, and any other relevant information.

Utilize Firestore's real-time database capabilities to ensure that data is synchronized across devices in real-time, providing users with up-to-date information. Define appropriate data models and structures within Firestore to efficiently organize and query your data.

Firebase Storage:

Store any media files such as images or videos related to agricultural data in Firebase Storage. This can include images of crops, soil conditions, or any other visual data collected by users.

Leverage Firebase Security Rules to control access to stored files and ensure data privacy and security.

Google Cloud Platform (GCP):

Utilize GCP services such as Cloud Functions or Cloud Run for serverless computing tasks. For example, you can trigger functions in response to specific events within your Firestore database, such as data updates or new user registrations.

Implement Cloud Pub/Sub for messaging between components of your application or to integrate with external systems.

If you're dealing with large datasets or require complex data analysis, consider using Google Big Query for performing analytics and generating insights from your agricultural data.

API for Weather Data:

Integrate the API for weather data into your Flutter application to provide users with real-time weather information relevant to their location or specified areas of interest.

Store weather data retrieved from the API in Firestore for historical tracking and analysis. You can create a separate collection or subcollection dedicated to storing weather-related data.

Security and Compliance:

Ensure that you adhere to best practices for security and compliance, especially when dealing with sensitive user data or integrating external APIs. Implement authentication and authorization mechanisms using Firebase Authentication to control access to your application's resources.

Regularly review and update your security measures to address any potential vulnerabilities and maintain compliance with relevant regulations.

Following are the Tools/ Platform which is used: -

Flutter: Continue utilizing Flutter as the framework for building your cross-platform mobile application. Flutter provides a rich set of UI components, hot reload functionality for rapid development, and excellent performance across different devices.

Firebase: Leverage Firebase for various backend services including authentication, real-time database (Firestore), cloud storage, and hosting. Ensure that you have set up Firebase Authentication to authenticate users securely, Firestore for storing data related to crops, weather, and user information, Cloud Storage for storing media files, and Firebase Hosting for deploying your Flutter application.

VS Code: Continue using Visual Studio Code (VS Code) as your primary integrated development environment (IDE) for Flutter app development. VS Code offers excellent

support for Flutter development with features like IntelliSense, debugging, and Flutter extensions that enhance productivity.

Figma: Figma is a powerful tool for designing user interfaces (UI) and user experience (UX) for your Flutter application. Use Figma to create wireframes, mockups, and prototypes of your app's UI/UX, allowing you to visualize and iterate on the design before implementing it in Flutter.

GitHub: GitHub serves as a central repository for your project's source code, facilitating collaboration among team members and version control. Ensure that you follow best practices for Git branching, commit messages, and pull requests to maintain a clean and organized codebase. Additionally, utilize GitHub Issues or project boards to track tasks, bugs, and feature requests.

CHAPTER-5

DESIGN/ IMPLEMENTATION /

MODELLING

CHAPTER 5**Design/ Implementation / Modelling****Renting Module:**

Design: The renting module facilitates the leasing of agricultural equipment or land. Design user interfaces for both renters and lessors to list their offerings and requirements, respectively. Include features such as adding items, booking.

Implementation: Utilize Firebase Firestore for storing rental listings, user profiles, and booking information. Implement Firebase Authentication for secure user authentication.

Modelling: Define Firestore collections for rental listings, user profiles, bookings. Create data models in Flutter to represent these entities and manage interactions with Firestore.

Rates for Grains Module:

Design: This module provides information on grain prices in different cities or regions. Design intuitive interfaces to display current rates.

Implementation: Adding grain price data in Firestore.

Modelling: Store grain price data in Firestore collections, organized by city or region. Define data models to represent grain types.

Weather Forecasting Module:

Design: Offer users accurate weather forecasts tailored to their locations. Design interfaces to display current conditions, daily forecasts, and severe weather alerts.

Implementation: Integrate with weather forecasting APIs to retrieve real-time weather data. Used geolocation services to determine the user's location. Implement caching mechanisms to reduce API calls and improve performance.

Modelling: Store weather data in Firestore collections, organized by location and time.

Schemes for Farmers Module:

Design: Provide information on government schemes, subsidies, and support programs available for farmers. Design interfaces to showcase scheme details, eligibility criteria.

Implementation: Populate scheme data from official government sources or user contributions.

Modelling: Store scheme details in Firestore collections, categorized by scheme type and region. Define data models for scheme attributes such as title, description, eligibility

.

1. Front-End Implementation



Fig. 5.1.1 - Logo

The very first screen that displays our logo welcome's the users for further introduction to the application. This incorporates a friendly greeting, a personalized touch highlighting the app's benefit, and an invitation to explore further, enticing users to delve deeper into the app.

After launching the app, you'll be greeted by our welcome screen featuring our logo. This serves as your entry point. Clicking the "Get Started" button will seamlessly transition you to the login screen, where you can begin your journey with **KrishiUrja**.

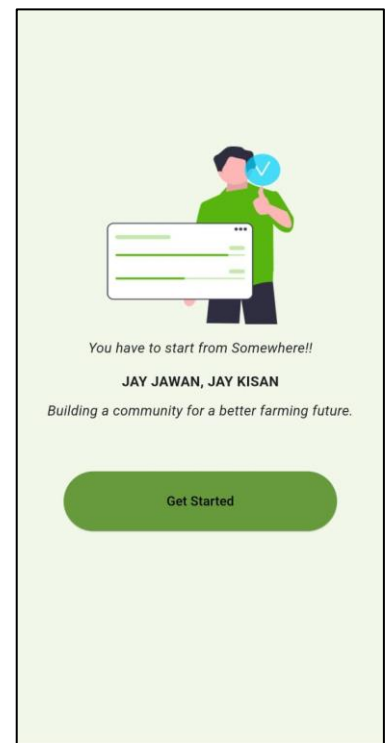
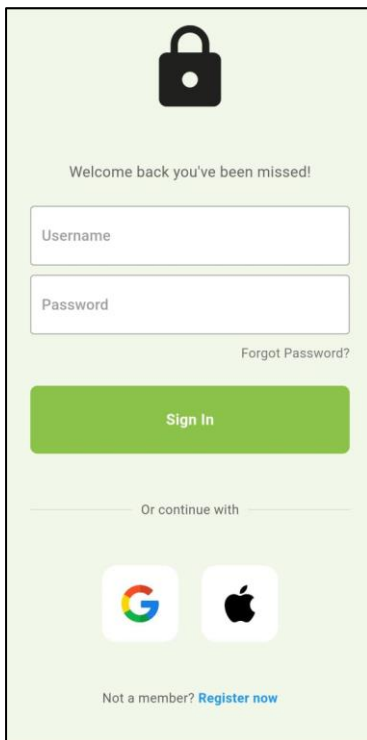


Fig. 5.1.2 - Welcome Page



The login screen acts as your gateway to [App Name]'s full potential. Here, you can enter your existing credentials to securely sign in and access the features and functionalities waiting for you.

Fig. 5.1.3 - User Login

After successfully logging in, you'll encounter a user selection screen. This screen presents you with various user types, each with their own designated set of tasks and functionalities within the application. Choose the user type that best reflects your role to unlock the most relevant features and experience tailored to your needs.

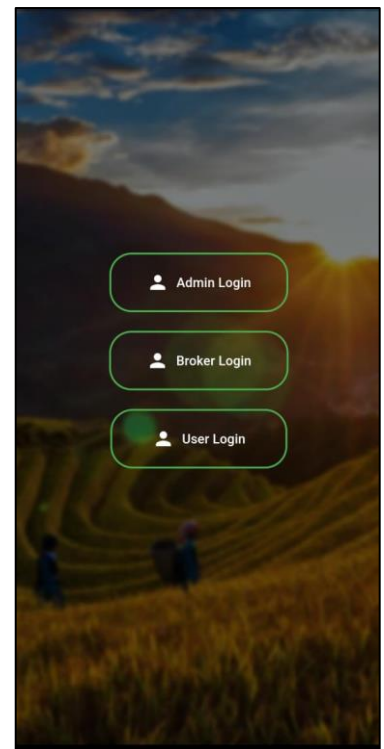


Fig. 5.1.4 - Screens

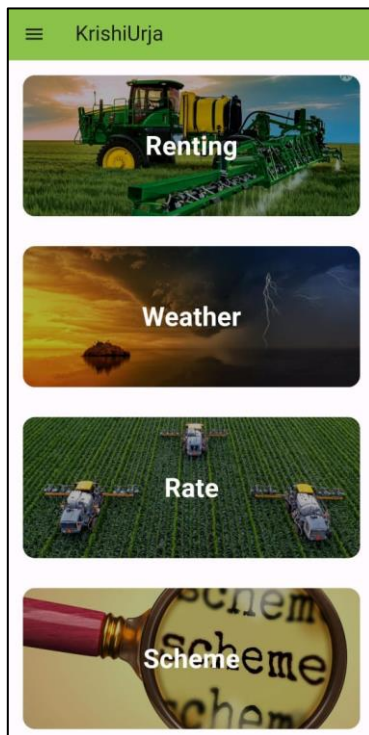


Fig. 5.1.5 - Home Page

The user menu page displays the list of modules that a user can access.

Renting - to rent a machine a user will be redirected to list of products registered on portal

Weather - it gives the current weather of the current location

Rates - it gives rates of different crops in different towns

Scheme - it gives list of schemes with the description and eligibility

Swipe or tap to reveal the app drawer, your one-stop shop for navigating KrishiUrja. This handy menu organizes all the app's features and functionalities, allowing you to easily jump to the specific page you need to accomplish your tasks.

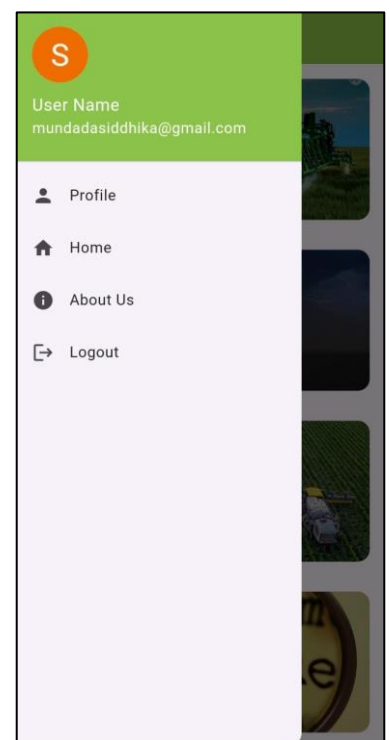


Fig. 5.1.6 - User App Drawer

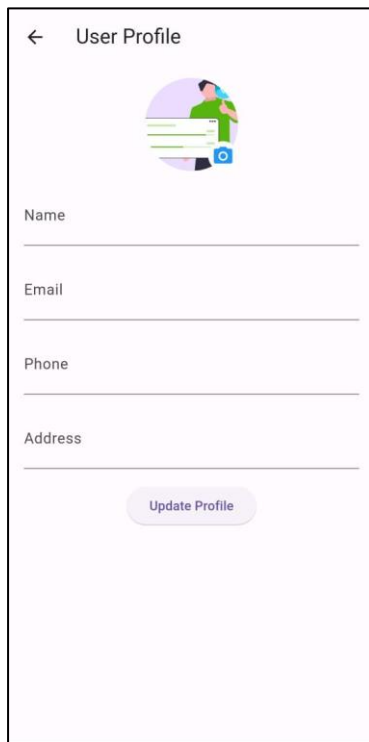


Fig. 5.1.7 - User Profile

This page empowers users to manage their personal information within the app. It functions as a central hub for profile editing. Users can update various details displayed on their profile, potentially including:

- Basic information: Edit fields like name, contact information (phone number, email address).
- Profile picture: Update or replace their profile picture for a more personalized touch.
- Additional details (optional): The app might allow users to edit other relevant details specific to its purpose, such as location or areas of interest.

The "About the App" page serves as a comprehensive resource for understanding the app's functionalities. Here, users can find a detailed description of the app itself, along with explanations for each of its key modules or features. This page helps users gain a deeper understanding of what the app offers and how they can leverage its various components to achieve their goals within the application.



Fig. 5.1.8 - About KrishiUrja

1. Working Of Renting Module

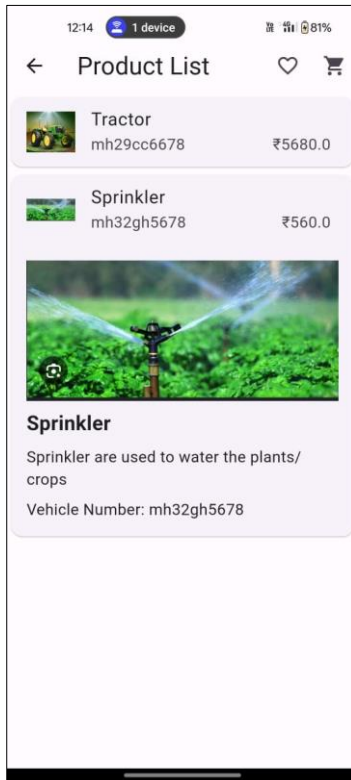


Fig. 5.2.1 - Browse and Explore Products

This page serves as your one-stop shop for discovering all the products available on the app. It displays a comprehensive list of products, potentially with brief descriptions, images, or prices. Clicking on a particular product delves deeper, presenting its full details. This detailed view might include comprehensive information like specifications, features, high-resolution images, and potentially reviews from other users. This allows you to browse, explore, and gain a thorough understanding of each product before making an informed decision.

Clicking on a product unlocks two convenient options to manage your shopping experience:

- **Add to Cart:** This action directly places the chosen product in your virtual shopping cart, signifying your intent to purchase it. You can then proceed to checkout and complete the rental or purchase process.
- **Add to Wishlist:** If you're interested in a product but aren't ready to commit to renting or buying it right away, you can add it to your wishlist. This creates a personalized list of products you can revisit later for easier reference and potential future purchases.

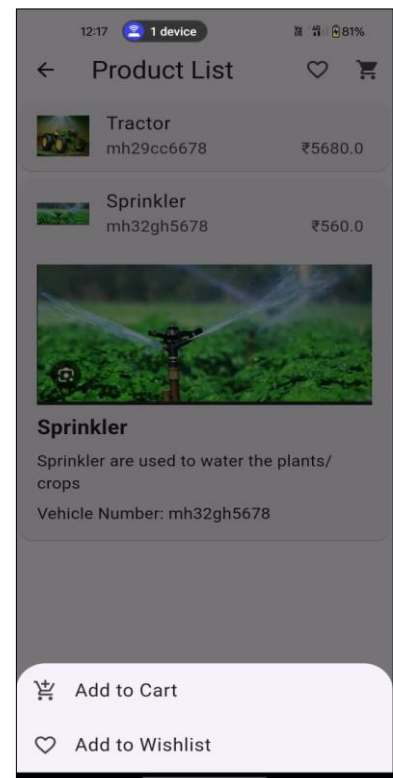
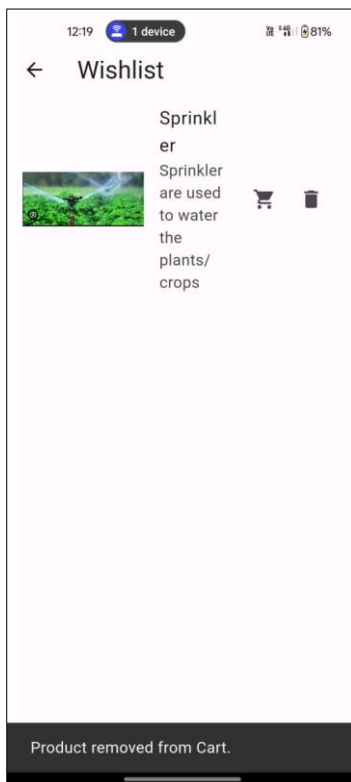


Fig. 5.2.2 - Cart/ Wishlist



The wishlist screen acts as your personalized product collection space. Here you'll find all the products you've chosen to "wish for" later. Each product entry might display a thumbnail image, title, and possibly a brief description. This screen empowers you to:

- **Add to Cart:** If you decide to move forward with renting or buying a product from your wishlist, you can easily add it to your shopping cart with a single tap. This streamlines the process of converting a wish into an actual purchase.
- **Delete from Wishlist:** If your interest in a product has waned, you can effortlessly remove it from your wishlist. This keeps your list organized and focused on the products that truly capture your attention.

Fig. 5.2.3 - Wishlist Page

The "Rent Product" button streamlines the rental process. Once you've meticulously entered the delivery address on the address screen, clicking this button initiates the rental process. The specific product will be reserved for you, and the rental agreement will be confirmed based on the app's guidelines and availability. This ensures a smooth and efficient way to secure the

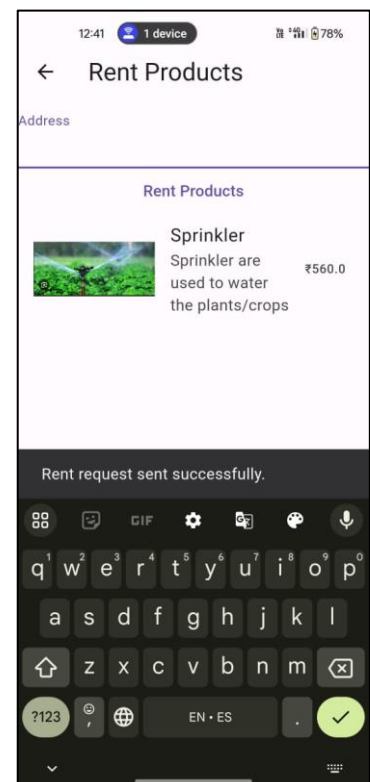


Fig. 5.2.4 - Rent Page

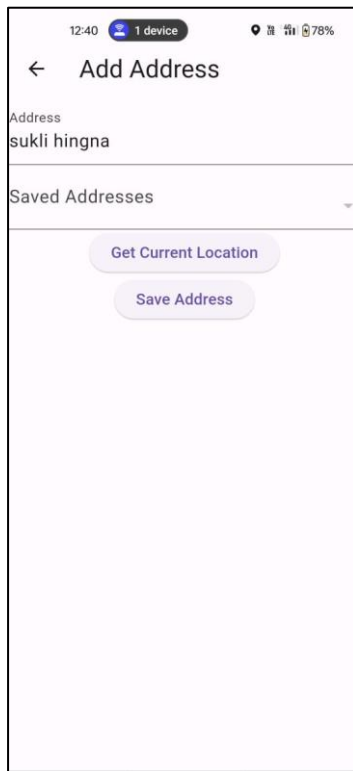


Fig. 5.2.5 - Address Page

This address page provides you with flexible options for specifying your delivery location:

- **Saved Addresses:** Quickly choose from a list of addresses you've previously stored in the app's database, eliminating the need to re-enter them.
- **Current Location:** Leverage your device's location services to automatically populate the address field with your current location.
- **Manual Entry:** If your desired delivery location isn't saved or differs from your current location, you can conveniently enter the full address details manually. This flexibility ensures you can always specify the most accurate delivery location for your needs.

This page acts as a central hub for managing your rental requests. It displays a clear list of all the rent requests you've submitted through the app. Each request might include details like the property you requested, the date submitted, and potentially the status (pending, approved, rejected). This consolidated view allows you to easily track your rental requests and stay updated on their progress.

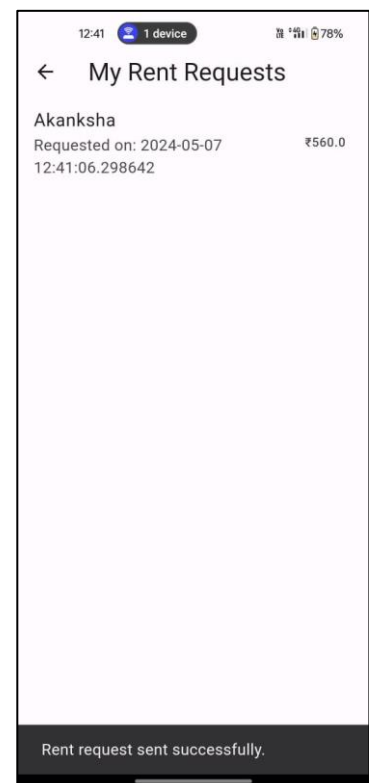


Fig. 5.2.6 - Renting request

2. Weather Forecasting Module

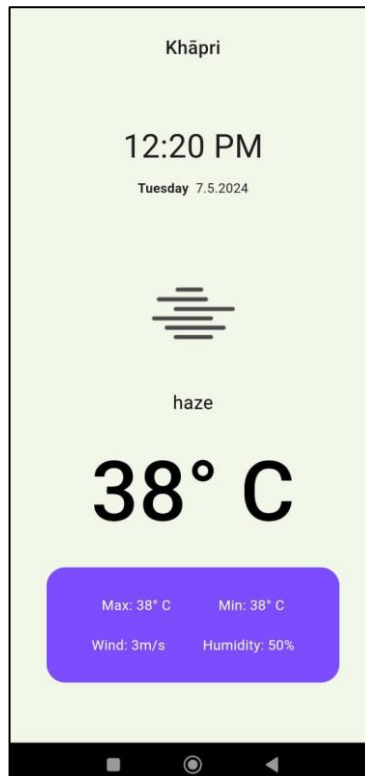


Fig. 5.3.1 - Weather Forecasting Pages

This screen provides a convenient way to stay informed about the current weather conditions. It leverages your device's location services to display the weather for your current location. Additionally, the information is presented visually with a weather condition image accompanying the textual details. This allows you to see the weather at a glance and quickly understand the current conditions.

3. Scheme Module



Fig. 5.4.1 - Scheme List Page

This page provides administrators with a powerful tool for managing government schemes within the app. Here, admins can:

- **Add a new scheme:** Define a new scheme by providing its name, a detailed description explaining its purpose and benefits, and outlining the eligibility criteria that users must meet to participate.
- **Edit existing schemes:** Modify details of previously added schemes. This might involve updating the name, description, or eligibility criteria to reflect any changes.
- **Delete schemes:** If a scheme is no longer applicable or needs to be removed from the app, admins can easily delete it from this page.

When a user clicks on a scheme name, it acts as an expandable element. This means the initial view will display a concise name or identifier for the scheme. Clicking on this name triggers an expansion animation, revealing a more detailed view. This detailed view might include additional information like descriptions, benefits, eligibility criteria, or any other relevant data associated with the scheme.

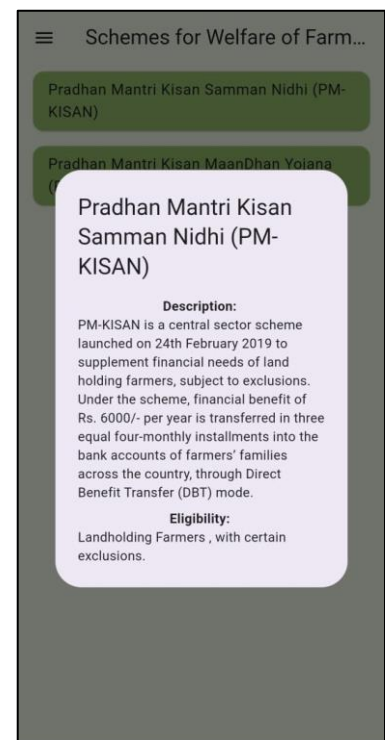


Fig. 5.4.2 - Scheme

4. Rate Module

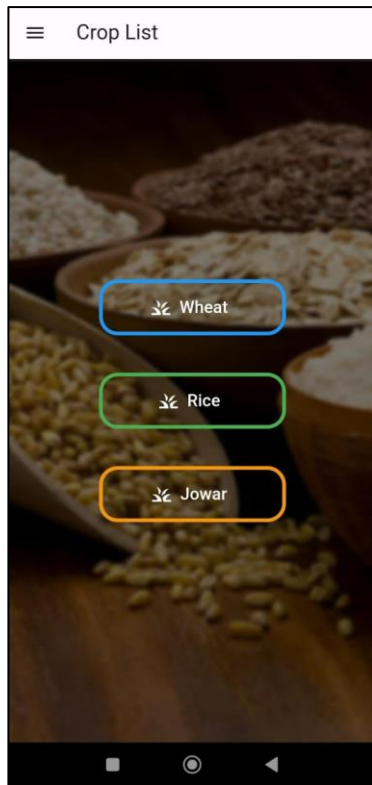


Fig. 5.5.1 - Crop List Page

This screen puts you in control! Select the crop you're ready to sell and explore market prices across different towns. Find the best deal for your harvest with just a few taps.

The information about crop rates will be presented in a clear and user-friendly manner. You'll see a table or list displaying various crops as rows and town names as columns. Each cell at the intersection of a crop and a town will show the corresponding price for selling that crop in that particular location. This allows you to easily compare prices and identify the most profitable market for your harvest.

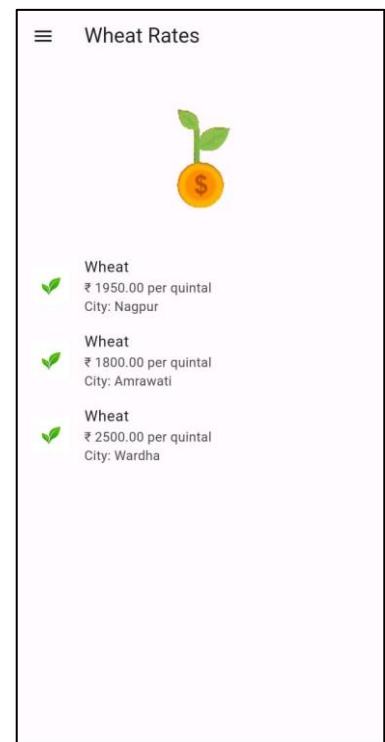


Fig. 5.5.2 - Wheat Rate Page

5. Back-End Implementation

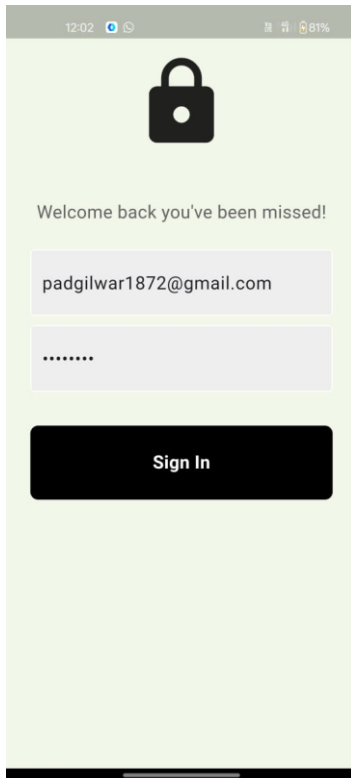


Fig. 5.6.1 - Admin Login

This screen serves as the entry point for brokers. Here, they can securely sign in using their unique credentials. Once logged in, brokers gain access to a set of functionalities specific to their role within the application. These functionalities might include managing their product listings, reviewing rental requests from users, and potentially monitoring rental activity or performance metrics associated with their products.

This hidden menu, accessible by swiping or tapping a designated area, serves as the broker's control center within the app. Here, brokers can navigate to key functionalities through a few options:

- **Rent Requests:** Access a dedicated page displaying all rental requests submitted by users for the products the broker has listed. This allows efficient management of incoming rentals.
- **Product List:** Switch to a page that showcases all the products the broker has currently added to the app. This provides a quick overview of their available rental offerings.
- **Logout:** Sign out of the broker account, providing

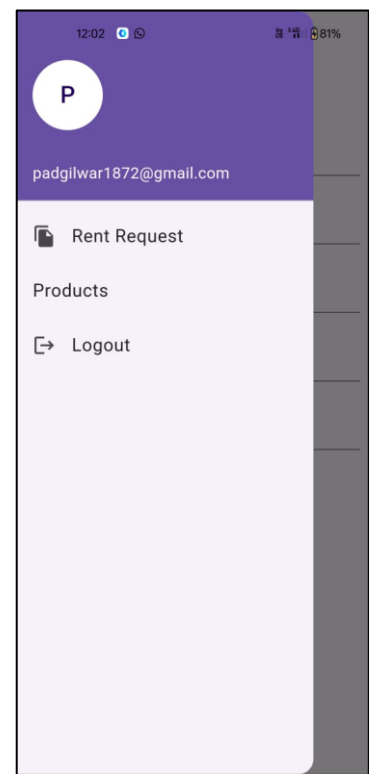


Fig. 5.6.2 - Admin drawer

12:02 81%

≡ Add Product

Product Name

Product Description

Product Price

Vehicle Number

Broker Mail Id
padgilwar1872@gmail.com

Select Product Image

Add Product

This page empowers brokers to effortlessly add new products to the application's rental listings. It acts as a central hub for product creation, allowing brokers to enter various details:

- **Product Information:** Specify essential details like the product name, description, and high-quality images to showcase its features effectively.
- **Availability & Pricing:** Indicate whether the product is currently available for rent and set the desired rental price per day or any other relevant pricing structure.

Once all the necessary details are entered and submitted, the product becomes visible to users browsing the app. This facilitates a seamless product listing experience for brokers.

Fig. 5.6.3 - Broker's Product Management Page

This page serves as the broker's central hub for managing their product listings within the app. It presents a comprehensive list of all the products the broker has added. Each product entry might showcase:

- **Product Details:** A brief overview including the product name, a thumbnail image, and potentially some key features.
- **Availability & Status:** Information about whether the product is currently available for rent (or unavailable due to existing rentals). This empowers brokers to monitor the rental status of their products.

This consolidated view allows brokers to easily review their product listings, edit details if needed, or even remove products that are no longer available for rent.

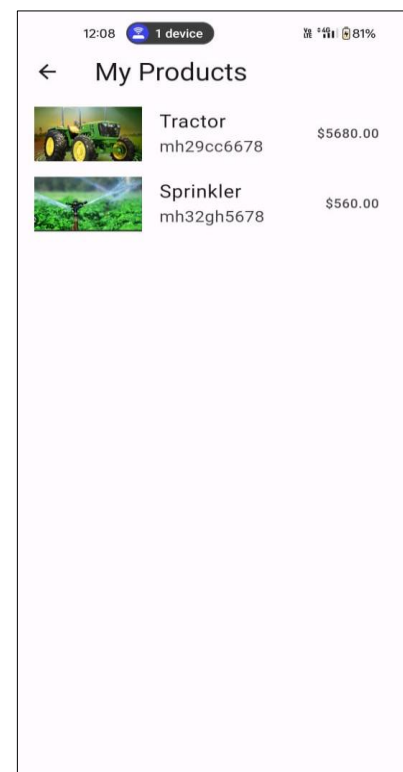


Fig. 5.6.4 - Product Page

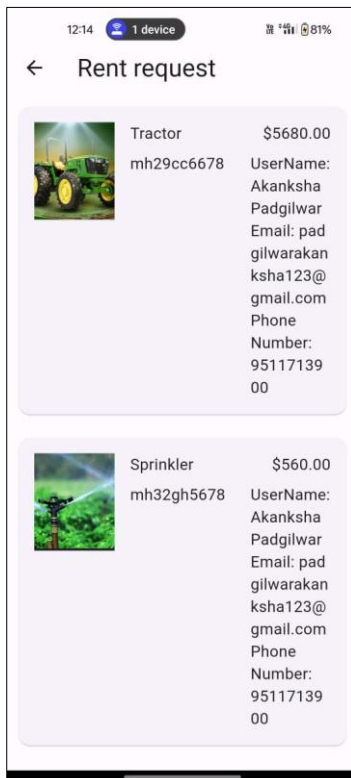


Fig. 5.6.5 - Rent Request

This screen serves as the broker's dashboard for managing rental requests. It displays a consolidated list of all requests submitted by users for products that the broker has added to the application. Each request might include details like:

- **User information:** Name, contact details of the user who submitted the request.
- **Product information:** Name, description of the product the user is requesting to rent.
- **Request details:** Date and time the request was submitted, any additional information provided by the user.

This centralized view allows brokers to efficiently review incoming rental requests, assess user suitability, and manage the rental process for their products.

This page empowers you to manage your crop listings. You can:

- **Add a new crop:** Enter details like the crop type, specify the price you want to sell it for, and choose the city where you have it available.
- **Edit existing listings:** Modify details of your previously added crops, including price or city, if needed.
- **Delete crops:** If a crop is no longer available or you want to remove it from the listing, you can easily delete its information from this page.

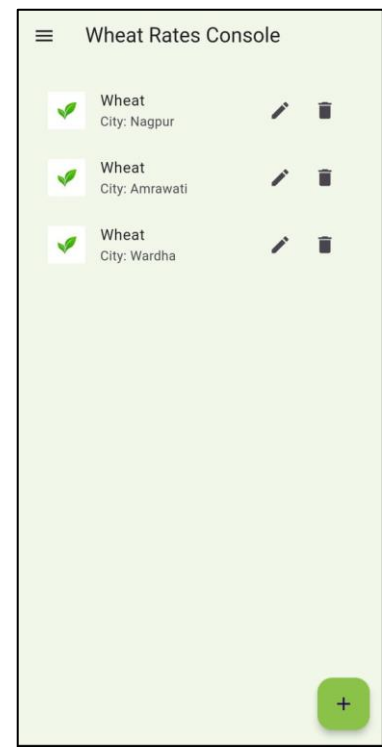


Fig. 5.6.6 - Crop Listing Page

CHAPTER-6

TESTING & SUMMARY OF RESULTS

CHAPTER-6

Testing & Summary of Results**1.1 Test the Login Functionality in KrishiUrja**

Test Case ID	001	Test Case Description	Test the Login Functionality in KrishiUrja	
Created By	Akanksha	Version	1.1	

Tester's Name	Akanksha	Date Tested	27/02/2024	Test Case (Pass/Fail/Not Executed)	Pass
----------------------	----------	--------------------	------------	---	------

S #	Prerequisites:
1	Access to Internet connection
2	

S #	Test Data
1	Userid = padgilwar1872@gmail.com
2	Pass = user@123

<u>Test Scenario</u>	Verify on entering valid userid and password, the Customer can login
-----------------------------	--

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Open KrishiUrja on your cell phone	App should open	As Expected	Pass
2	Enter Userid & Password	Credential can be entered	As Expected	Pass
3	Click Login in with Email	Customer is logged in	As Expected	Pass

1.2 Test the Login Functionality for Admin in KrishiUrja

Test Case ID	002	Test Case Description	Test the Login Functionality for Admin in KrishiUrja	
Created By	Akanksha	Version	1.1	

Tester's Name	Akanksha	Date Tested	02/03/2024	Test Case (Pass/Fail/Not Executed)	Pass
----------------------	----------	--------------------	------------	---	------

S #	Prerequisites:
1	Access to Internet connection
2	
3	
4	

S #	Test Data
1	Userid = padgilwar1872@gmail.com
2	Pass = user@123
3	
4	

<u>Test Scenario</u>	Verify on entering valid userid and password, the Admin can login
-----------------------------	---

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Open KrishiUrja on your cell phone	App should open	As Expected	Pass
2	Enter Userid & Password	Credential can be entered	As Expected	Pass
3	Click Login in with Email	Admin is logged in	As Expected	Pass

1.3 Test the Login Functionality in KrishiUrja

Test Case ID	003	Test Case Description	Test the Login Functionality in KrishiUrja	
Created By	Akanksha	Version	1.1	

Tester's Name	Akanksha	Date Tested	27/02/2024	Test Case (Pass/Fail/Not Executed)	Pass
----------------------	----------	--------------------	------------	---	------

S #	Prerequisites:
1	Access to Internet connection
2	
3	
4	

S #	Test Data
1	Userid = padgilwar1872@gmail.com
2	Pass = user@123
3	
4	

<u>Test Scenario</u>	Verify on entering valid userid and password, the Customer can login
-----------------------------	--

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Open KrishiUrja on your cell phone	App should open	As Expected	Pass
2	Enter Userid & Password	Credential can be entered	As Expected	Pass
3	Click Login in with Email	Admin is logged in	As Expected	Fail

1.4 Test the Functionality to check weather

Test Case ID	004	Test Case Description	Test the Functionality to check weather	
Created By	Akanksha	Version	1.1	

Tester's Name	Akanksha	Date Tested	27/02/2024	Test Case (Pass/Fail/Not Executed)	Pass
----------------------	----------	--------------------	------------	---	------

S #	Prerequisites:
1	Access to Internet connection
2	

S #	Test Data
1	Userid = padgilwar1872@gmail.com
2	Pass = user@123

<u>Test Scenario</u>	Verify on entering valid userid and password, the Customer can login and check weather on the application
-----------------------------	---

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Open KrishiUrja on your cell phone	App should open	As Expected	Pass
2	Click Login in with Email	Admin is logged in	As Expected	Pass
3	Click on weather option on menu screen	Navigate to weather page	As Expected	Pass
4	Click on logout	Logs out to home screen	As Expected	Pass

1.5 Test the Functionality to Renting function

Test Case ID	005	Test Case Description	Test the Functionality to Renting function	
Created By	Akanksha	Version	1.1	

Tester's Name	Akanksha	Date Tested	27/02/2024	Test Case (Pass/Fail/Not Executed)	Pass
----------------------	----------	--------------------	------------	---	------

S #	Prerequisites:
1	Access to Internet connection
2	

S #	Test Data
1	Userid = padgilwar1872@gmail.com
2	Pass = user@123

<u>Test Scenario</u>	Verify on entering valid userid and password, the Customer can login, and can check different product on the platform and rent a product according to needs
-----------------------------	---

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Open KrishiUrja on your cell phone	App should open	As Expected	Pass
2	Click Login in with Email	Admin is logged in	As Expected	Pass
3	Click on Renting option on menu screen	Navigate to Renting page	As Expected	Pass
4	Select the product and add to cart	Product added to cart	As Expected	Pass

5	Enter Address	Credential can be entered	As Expected	Pass
6	Send Rent Request	Rent request send	As Expected	Pass
7	Order page	Show details of the product rented	As Expected	Pass
8	Click on logout	Logs out to home screen	As Expected	Pass

1.6 Test the Functionality to check Crop rates

Test Case ID	006	Test Case Description	Test the Functionality to check Crop rates	
Created By	Akanksha	Version	1.1	

Tester's Name	Akanksha	Date Tested	27/02/2024	Test Case (Pass/Fail/Not Executed)	Pass
----------------------	----------	--------------------	------------	---	------

S #	Prerequisites:
1	Access to Internet connection
2	

S #	Test Data
1	Userid = padgilwar1872@gmail.com
2	Pass = user@123

<u>Test Scenario</u>	Verify on entering valid userid and password, the Customer can login, and check rates of different crops in different towns
-----------------------------	---

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Open KrishiUrja on your cell phone	App should open	As Expected	Pass
2	Click Login in with Email	Admin is logged in	As Expected	Pass
3	Click on rates option on menu screen	Navigate to rates page	As Expected	Pass
4	Select the desired crop	Navigate to rates of that crop	As Expected	Pass
5	View rates of the crop	Display crop rate	As Expected	Pass

1.7 Test the Functionality to check Scheme

Test Case ID	007	Test Case Description	Test the Functionality to check Scheme	
Created By	Akanksha	Version	1.1	

Tester's Name	Akanksha	Date Tested	27/02/2024	Test Case (Pass/Fail/Not Executed)	Pass
----------------------	----------	--------------------	------------	---	------

S #	Prerequisites:
1	Access to Internet connection
2	

S #	Test Data
1	Userid = padgilwar1872@gmail.com
2	Pass = user@123

<u>Test Scenario</u>	Verify on entering valid userid and password, the Customer can login, and check different government and non government schemes
-----------------------------	---

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Open KrishiUrja on your cell phone	App should open	As Expected	Pass
2	Click Login in with Email	Admin is logged in	As Expected	Pass
3	Click on Scheme option on menu screen	Navigate to Scheme page	As Expected	Pass
4	View different scheme	Lets user check different scheme	As Expected	Pass
5	Click on logout	Logs out to home screen	As Expected	Pass

CHAPTER- 7

CONCLUSION AND FUTURE SCOPE

CHAPTER- 7**Conclusion And Future Scope**

The KrishiUrja project is a comprehensive web-based platform that integrates four main modules to support agricultural development in India. The project aims to provide a one-stop solution for farmers to access agricultural machinery renting, weather information, crop rates, and government and private schemes. The proposed methodology involves a user-centered design approach, open-source technologies, and rigorous testing and validation to ensure usability, functionality, and effectiveness.

The KrishiUrja project has several potential benefits for farmers, agricultural experts, and other stakeholders in India. The project can improve agricultural productivity, reduce costs, and promote sustainable agricultural practices. The following are the key conclusions and future scope of the KrishiUrja project:

1. **Improving Agricultural Productivity** : The KrishiUrja project can improve agricultural productivity by providing farmers with access to a wide range of agricultural machinery. The renting module allows farmers to rent machinery based on their needs and location, reducing the need for expensive equipment purchases. The weather module provides farmers with real-time weather data, allowing them to plan their agricultural activities and optimize crop yields.
2. **Reducing Costs** : The KrishiUrja project can reduce costs for farmers by providing them with information on crop rates and government and private schemes. The rates module allows farmers to compare and make informed decisions on the best markets to sell their produce. The schemes module provides farmers with information on available schemes, including eligibility criteria, application procedures, and deadlines.
3. **Promoting Sustainable Agricultural Practices** : The KrishiUrja project can promote sustainable agricultural practices by providing farmers with information on weather patterns and crop rates. The weather module allows farmers to plan their agricultural activities based

on real-time weather data, reducing the risk of crop damage due to extreme weather conditions. The rates module provides farmers with information on market trends, allowing them to make informed decisions on crop selection and planting dates.

4. **User-Centered Design Approach** : The KrishiUrja project involves a user-centered design approach, involving farmers, agricultural experts, and other stakeholders in the development process. This approach ensures that the platform is tailored to the needs and preferences of the target audience, increasing its usability and effectiveness.

5. **Open-Source Technologies** : The KrishiUrja project uses open-source technologies, including HTML, CSS, JavaScript, and PHP, to ensure scalability, reliability, and cost-effectiveness. This approach allows for easy customization and maintenance of the platform, reducing development and maintenance costs.

6. **Testing and Validation** : The KrishiUrja project involves rigorous testing and validation, including user testing and expert review, to ensure usability, functionality, and effectiveness. This approach ensures that the platform meets the needs and expectations of the target audience, increasing its adoption and impact. The KrishiUrja project has several potential areas for future research and development. The following are some of the key areas for future scope:

- I. **Integration with Other Platforms** : The KrishiUrja project can be integrated with other platforms, such as e-commerce platforms, to provide farmers with a seamless experience. The integration can allow farmers to rent machinery, access weather data, and sell their produce on a single platform, reducing transaction costs and increasing efficiency.
- II. **Artificial Intelligence and Machine Learning** : The KrishiUrja project can leverage artificial intelligence and machine learning to provide personalized recommendations to farmers. The platform can use machine learning algorithms to analyze weather patterns, crop rates, and other data to provide farmers with personalized recommendations on crop selection, planting dates, and other agricultural activities.
- III. **Mobile Application** : The KrishiUrja project can be developed as a mobile application, allowing farmers to access the platform on their mobile devices. The

mobile application can provide farmers with real-time weather data, crop rates, and other information, allowing them to make informed decisions on the go.

- IV. **Data Analytics** : The KrishiUrja project can leverage data analytics to provide farmers with insights into agricultural trends and patterns. The platform can use data analytics tools to analyse weather patterns, crop rates, and other data to provide farmers with insights into market trends, crop selection, and other agricultural activities.
- V. **Collaboration with Government Agencies** : The KrishiUrja project can collaborate with government agencies to provide farmers with access to government schemes and programs. The collaboration can allow farmers to access government schemes and programs on the KrishiUrja platform, reducing the need for separate applications and approvals.
- VI. **Expansion to Other Regions** : The KrishiUrja project can be expanded to other regions in India, allowing farmers in different regions to access the platform. The expansion can allow the platform to reach a wider audience, increasing its impact and relevance.

In conclusion, the KrishiUrja project is a comprehensive web-based platform that integrates four main modules to support agricultural development in India. The project has the potential to improve agricultural productivity, reduce costs, and promote sustainable agricultural practices. The proposed methodology involves a user-centered design approach, open-source technologies, and rigorous testing and validation to ensure usability, functionality, and effectiveness. The project has several potential areas for future research and development, including integration with other platforms, artificial intelligence and machine learning, mobile application, data analytics, collaboration with government agencies, and expansion to other regions. The KrishiUrja project has the potential to revolutionize agricultural development in India, providing farmers with a one-stop solution for their agricultural needs.

REFERENCES

References

1. Kumar, P., & Kumar, S. (2018). Agricultural Challenges in India: A Comprehensive Review , International Journal of Current Microbiology and Applied Sciences, 7(10), 2314-2321.
2. Auffhammer, M. A., & Carleton, T. A. (2022). The impact of weather shocks on crop yields: evidence from India. Agricultural and Resource Economics Review, 51(3), 403-426.
/978ECA4655E6922A6E0D1569C8107FE6
3. Tamiru Lemi , Effects of Climate Change Variability on Agricultural Productivity , February 2019 , DOI:10.19080/IJESNR.2019.17.555953
4. A Review on Climate Change and its Impact on Agriculture in India , December 2020 , Current Journal of Applied Science and Technology , DOI:10.9734/cjast/2020/v39i4431152
5. , Zhihong Xu ,Anjorin Ezekiel Adeyemi ,Emily Catalan,Shuai Ma,Ashlynn Kogut,Cristina Guzman , A scoping review on technology applications in agricultural extension , Published: November 6, 2023, <https://doi.org/10.1371/journal.pone.0292877>
6. Shoaib Farooq , Riaz, Adnan Abid , Tariq Umer , COMSATS University Islamabad, Role of IoT Technology in Agriculture: A Systematic Literature Review , February 2020 Electronics 9(2):319 , DOI:10.3390/electronics9020319
7. Brian Bothwell ,Steve D. Morris , Precision Agriculture: Benefits and Challenges for Technology Adoption and Use , GAO-24-105962 , Published: Jan 31, 2024. Publicly Released: Jan 31, 2024.

8.Marcelo Werneck Barbosa, Government Support Mechanisms for Sustainable Agriculture: A Systematic Literature Review and Future Research Agenda , Department of Agricultural Economics, Pontificia Universidad Católica de Chile, Santiago 7820436, Chile Sustainability 2024.

9.Lina M Bastidas-Orrego, Natalia Jaramillo, Julián A Castillo-Grisales, Yony F Ceballos, A systematic review of the evaluation of agricultural policies: Using prisma ,Affiliations expand PMID: 37771541 PMCID:PMC10522931 DOI: 10.1016/j.heliyon.2023.e20292 ,2023

10. Raphael Lencucha,corresponding, Nicole E. Pal,Adriana Appau Anne-Marie Thow and Jeffrey Drope, Government policy and agricultural production: a scoping review to inform research and policy on healthy agricultural commodities ,Published online 2020 Jan.

11.Noor ul Islam Wani , Technology of Kashmir , Abdul Hakeem , Hazara University , Rahat Wani , Junaid Ayaz , Information and Communication Technology in Agriculture: A Kashmir Perspective , January 2017.

12.Claudia Ayim , A. Kassahun,, Chris Addison ,Bedir Tekinerdogan , Adoption of ICT , innovations in the agriculture sector in Africa: a review of the literature , March 2022Agriculture & Food Security , March 2022

13. Haki Pamuk , Marcel van Asseldonk Cor Wattel , Stanley Karanja , Joseph Philip Hella , Ruerd Ruben, , Community-based approaches to support the anchoring of climate-smart agriculture in Tanzania

**REPRINTS OF RESEARCH
PUBLICATIONS & CONFERENCE
CERTIFICATES
(INTERNATIONAL/ NATIONAL)**

List of Publications

International / National Journal

1. Akanksha Padgilwar, Kajal Katheriya, Siddhika Mundada, “Sustainable Agriculture In Maharashtra: A Technological Renaissance For Prosperity”, Journal Of International Research Journal of Modernization in Engineering Technology and Science, Vol.06 Issue 03, March-2024.
2. Akanksha Padgilwar, Kajal Katheriya, Siddhika Mundada, “KrishiUrja: A Technological Paradigm for Agricultural Empowerment and Sustainable Farming Practices in Maharashtra, India”, National conference on Emerging Trends in engineering & Management, 20 April 2024.

SUSTAINABLE AGRICULTURE IN MAHARASHTRA: A TECHNOLOGICAL RENAISSANCE FOR PROSPERITY

Sharayu Deote^{*1}, Akanksha Padgilwar^{*2}, Kajal Katheriya^{*3}, Siddhika Mundada^{*4}

^{*1}Professor, Department Of Computer Engineering, Cummins College Of Engineering For Women, Nagpur, Maharashtra, India.

^{*2,3,4}Student, Department Of Computer Engineering, Cummins College Of Engineering For Women, Nagpur, Maharashtra, India.

ABSTRACT

This project aims to revitalize the agricultural sector in Maharashtra, focusing on improving the livelihoods of farmers through a multi-faceted approach. In this endeavor, we propose the deployment of modern agricultural machinery available for rent to facilitate efficient cultivation and harvesting. Additionally, we will establish an information dissemination system to provide farmers with critical data on crop rates in various towns, weather forecasts, and government schemes. This information will empower farmers to make informed decisions about when and where to sell their produce, optimize planting times, and mitigate risks associated with unpredictable weather patterns.

The project will foster the adoption of climate-resilient farming practices and crop diversification. It will also include training programs for skill development and the promotion of sustainable agriculture. By addressing challenges related to irrigation, access to credit, and market knowledge, this initiative aims to boost agricultural productivity, enhance farmers' income, and ensure food security in Maharashtra. Collaboration with government agencies, local communities, and technology providers will be pivotal to the success of this project.

Keywords: Maharashtra, Agricultural Prosperity, Technology-Driven Farming, Information Dissemination, Crop Rates, Weather Forecast.

I. INTRODUCTION

India, often described as an agricultural-dominant nation, places farmers at the heart of its societal and economic fabric. These dedicated individuals form the backbone of the country's agricultural sector, a sector deeply interwoven with the nation's identity. They not only sustain the nation's food security but also provide essential raw materials for various industries. This symbiotic relationship with agriculture is pivotal, given that approximately 72 percent of India's population resides in rural areas, where agriculture serves as the primary source of livelihood.

Despite the agricultural sector's immense significance, a paradox looms large. While nearly 70 percent of the population is dependent on agriculture, the sector has not yielded the expected economic growth. This conundrum underscores the need for comprehensive reforms and investments in the agricultural ecosystem.

Historically, agriculture in India has faced numerous challenges, including fragmented landholdings, inadequate infrastructure, and weather-related uncertainties. The predominance of small and marginal farmers exacerbates these issues, limiting their access to modern farming techniques and markets. As a result, the potential for growth and prosperity within the sector has remained largely untapped. This paper explores these challenges and trying to find solution in a form of a mobile application designed to empower farmers with the tools and information they need to overcome these obstacles and thrive in their profession.

II. METHODOLOGY

In this section, we outline the methodology employed in our research work, focusing on key elements such as Maharashtra's agricultural landscape, technology-driven farming approaches[1], information dissemination strategies, crop rates analysis, and weather forecasting techniques.

Data Collection:

We initiated our research by collecting data pertaining to agricultural practices, crop rates, and weather patterns in Maharashtra. This involved gathering information from reliable sources such as government reports, agricultural databases, and meteorological services.

Analysis of Agricultural Practices:

We conducted a comprehensive analysis of agricultural practices prevalent in Maharashtra, considering factors such as crop cultivation techniques, irrigation methods, and use of modern farming equipment. This analysis provided insights into the current state of agriculture in the region.

Information Dissemination Strategies:

Recognizing the importance of disseminating relevant information to farmers, we devised strategies for effectively communicating agricultural insights, market trends, and weather forecasts. These strategies aim to empower farmers with timely and accurate information to make informed decisions.

Crop Rates Analysis:

We analyzed crop rates in Maharashtra to understand market dynamics and price fluctuations. This analysis involved studying historical data, market trends, and factors influencing crop prices, enabling us to provide valuable insights to farmers.

Weather Forecasting Techniques:

Lastly, we explored advanced weather forecasting techniques to provide farmers with reliable predictions tailored to their specific geographic locations in Maharashtra. This involved leveraging meteorological data, satellite imagery, and predictive modeling to deliver accurate forecasts.

Through the integration of these methodologies, our research endeavors to contribute to agricultural prosperity in Maharashtra by leveraging technology-driven farming practices[2], facilitating information dissemination, analyzing crop rates, and providing reliable weather forecasts tailored to the needs of farmers in the region.

III. MODELING AND ANALYSIS

The agricultural sector in Maharashtra, like in many other regions, faces various challenges that impact the livelihoods of farmers. To enhance the agricultural sector and ensure sustainable income for farmers, several strategies and initiatives can be considered[4].

Table 1. Statistical Analysis of Agricultural data of India[6]

State	Major Crops Produced	Primary Crop	Non-Profitable Crops	Profitability	Amount Required for Cultivation to Harvesting (INR/hectare)	Net Farm Income Expected (INR/hectare)
Andhra Pradesh	Rice, Cotton, Tobacco, Sugarcane	Rice	Tobacco, Cotton	Medium	60,000-100,000	100,000-150,000
Assam	Rice, Tea, Jute, Oilseeds	Tea	Jute, Oilseeds	Low	40,000-60,000	50,000-80,000
Bihar	Rice, Wheat, Maize, Pulses	Rice	Maize, Pulses	Low	30,000-40,000	40,000-60,000
Haryana	Wheat, Mustard, Gram, Sugarcane	Wheat	Mustard, Gram	High	70,000-90,000	120,000-160,000
Karnataka	Rice, Sugarcane, Coffee, Cotton	Rice	Coffee, Cotton	Medium	60,000-100,000	100,000-150,000
Kerala	Rice, Coconut, Rubber, Cashew	Coconut	Rubber, Cashew	High	80,000-120,000	150,000-200,000
Madhya Pradesh	Wheat, Soybean, Cotton, Gram	Wheat	Soybean, Gram	High	70,000-90,000	120,000-160,000

Maharashtra	Sugarcane, Cotton, Soybean, Rice	Sugarcane	Cotton, Soybean	Medium	80,000-160,000	150,000-200,000
Punjab	Wheat, Rice, Maize, Cotton	Wheat	Rice, Maize	High	70,000-90,000	120,000-160,000
Rajasthan	Wheat, Mustard, Gram, Cotton	Wheat	Mustard, Gram	Medium	60,000-100,000	100,000-150,000
Tamil Nadu	Rice, Sugarcane, Coconut, Cotton	Rice	Coconut, Cotton	Medium	60,000-100,000	100,000-150,000
Uttar Pradesh	Wheat, Rice, Sugarcane, Potato	Wheat	Potato	High	70,000-90,000	120,000-160,000
West Bengal	Rice, Jute, Sugarcane, Potato	Jute	Jute, Potato	Medium	60,000-100,000	100,000-150,000

- 1. Improved Irrigation Facilities:** Maharashtra is prone to erratic rainfall, leading to droughts and water scarcity. Investing in irrigation infrastructure like dams, canals, and modern irrigation techniques such as drip and sprinkler systems can help mitigate water-related challenges. This ensures a more reliable water supply for crops, reducing dependence on monsoons.
- 2. Access to Affordable Credit:** Farmers often struggle to access credit at reasonable interest rates. The government can work with financial institutions to provide farmers with affordable loans, enabling them to invest in better seeds, equipment, and technologies.
- 3. Market Information:** Lack of access to market information can lead to farmers selling their produce at lower prices. Establishing market information systems that provide real-time price data and market trends can empower farmers to make informed decisions about when and where to sell their crops.
- 4. Crop Diversification:** Encouraging farmers to diversify their crops can reduce risks associated with monoculture farming. Promoting the cultivation of high-value and climate-resilient crops can improve income stability and reduce vulnerability to pests and diseases.
- 5. Research and Development:** Investing in agricultural research and development is crucial for increasing crop yields and improving farming practices. Research institutions can work on developing new crop varieties that are better suited to local conditions and are resistant to pests and diseases.
- 6. Food Security Initiatives:** Ensuring food security for all should be a top priority. The government can implement programs that guarantee a minimum support price for certain crops, buffer stock maintenance, and efficient distribution systems to ensure that everyone has access to affordable and nutritious food.
- 7. Technology Adoption:** Promoting the use of modern farming technologies, such as precision agriculture, digital farming tools, and drones for crop monitoring, can help farmers increase productivity and reduce resource wastage.
- 8. Skill Development:** Providing training and skill development programs to farmers can improve their knowledge of best agricultural practices, sustainable farming techniques, and efficient resource management.
- 9. Climate Resilience:** Given the impact of climate change, it's essential to promote climate-resilient farming practices. This includes the adoption of drought-resistant crops, organic farming methods, and sustainable land management practices.

By addressing these challenges and implementing these suggestions, Maharashtra can strengthen its agricultural sector, enhance the livelihoods of farmers, and contribute to food security and economic growth in the region. Collaboration between government, farmers, and agricultural stakeholders is essential for the successful implementation of these initiatives[5].

IV. RESULTS AND DISCUSSION

The deployment of modern agricultural machinery and the establishment of an information dissemination system represent crucial steps towards revitalizing Maharashtra's agricultural sector. By facilitating access to efficient cultivation and harvesting tools through rental services[3], farmers can significantly enhance their productivity and reduce labor-intensive processes. Moreover, the provision of critical data on crop rates, weather forecasts, and government schemes empowers farmers to make informed decisions, optimizing their planting and selling strategies while mitigating risks associated with unpredictable weather patterns. This multi-faceted approach not only fosters the adoption of climate-resilient farming practices and crop diversification but also addresses key challenges such as irrigation, access to credit, and market knowledge. Through collaboration with government agencies, local communities, and technology providers, this initiative aims to boost agricultural productivity, enhance farmers' income, and ensure food security in Maharashtra. The success of this project hinges on its ability to effectively integrate technological solutions with traditional farming practices, thereby empowering farmers to thrive in an increasingly competitive agricultural landscape.

V. CONCLUSION

In conclusion, the innovative mobile application discussed here has the potential to revolutionize the agricultural sector in India by providing farmers with access to vital information at their fingertips. The application's comprehensive features, combined with the latest technology stack, ensure a seamless user experience and streamline farming operations for greater efficiency.

By offering services such as machine rentals, real-time weather forecasts, market prices of grains across various cities, and insights into government assistance schemes, this application empowers farmers to make informed decisions. These informed choices, in turn, hold the promise of improving crop yields and enhancing financial returns for farmers.

Overall, the adoption of such technological solutions has the capacity to significantly impact the lives of farmers positively. It can contribute not only to their well-being but also to the overall growth and development of the agriculture industry in India. This innovation represents a crucial step towards modernizing and optimizing farming practices, ensuring sustainability, and addressing the challenges faced by farmers in the country.

VI. REFERENCES

- [1] Krunal Bagaitkar¹, Khoshant Lande. 2019. 'Tractor Hiring Application for Farmers'. Department of Information Technology, S.B Jain Institute of Technology, Management and Research, Nagpur Project Guide, Department of Information and Technology, S.B Jain Institute of Technology, Management and Research, Nagpur.
- [2] Seung-Yeoub Shin, Chang-Ho Kang. 2014. 'Web-based Agricultural Machinery Rental Business Management System'. National Academy of Agricultural Science Korea Department of Bio-Mechatronic Engineering, Sungkyunkwan University, Suwon, Korea
- [3] M Nagendra Raju, Dr T Manikumar, Dr N Naveenkumar. 2022 "WEB BASED FORM EQUIPMENT RENTAL SYSTEM FOR AGRICULTURE" INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT) RT An International Open Access, Peer-reviewed, Refereed Journal
- [4] Economic Survey of Maharashtra 2021-22 by DIRECTORATE OF ECONOMICS AND STATISTICS, PLANNING DEPARTMENT,
- [5] MAHARASHTRA State Farmer Guide by GOVERNMENT OF INDIA Ministry of Agriculture Department of Agriculture & Cooperation Mechanization & Technology Division
- [6] District Wise Crop Production in Maharashtra: Major Crops in Maharashtra by Jagdish published on march 10, 2022



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in **National Conference on Emerging Trends in Engineering & Management** held on 19th & 20th April 2024, organized by Department of Mechanical Engineering, Guru Gobind Singh College of Engineering & Research Centre, Nashik

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Dr. Milind S. Patil
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Dr. Milind S. Patil
Co-convener

Dr. Chandrashekhar D. Mohod
Convener

Dr. Neelkanth G. Nikam
Principal

Picture with Guide: -



Guide: - Prof. Sharayu deote.

Team Members: - Akanksha Padgilwar, Kajal Katheriya, Siddhika Mundada