

Artificial Intelligence based Agricultural Chatbot and Virtual Assistant for Delivery of Harvested Crops

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Abstract: The integration of artificial intelligence (AI) in agriculture has the potential to revolutionize the industry, making it more efficient, sustainable, and productive. AI can be used to analyze data from various sources, such as satellite imagery, drones, and sensors, to provide farmers with valuable insights. It helps in optimizing irrigation, fertilization, and pesticide application by identifying areas of the field that require attention. AI algorithms can also predict crop yield, disease outbreaks, and recommend optimal planting and harvesting times. AI-powered systems can monitor crops and livestock through computer vision techniques and sensor data analysis. This enables early detection of plant diseases, nutrient deficiencies, or pest infestations. Livestock monitoring can include facial recognition to identify individual animals, behavior analysis to detect signs of illness or distress, and automated feeding systems. In developing countries like India, the rapid spread of mobile internet technology is offering a vital role in economic growth, social empowerment, and grass roots creativity. Every harvested crop needs to be transported. Transportation is one of the important factors for a farmer's success. Transport that is well-managed is effective in transporting farm resources and harvested products as quickly as possible. So we are going to develop an android application for farmers and transport service providers. By this, we can pool the farmers according to their requirements.

Keywords – Crop transport, Chat-bot, Virtual assistant, transport, Cost reduction.

I. Introduction

Ridesharing, as defined here, is an arrangement in which a farmer's goods are transported in a truck by its owner. Truck-sharing is defined as "an agreement in which a passenger shares the truck space with another person's vehicle for a predetermined period, for a profitable price. It is done using an agro App or website. In addition, a user, a rider, or truck partner is the end-user that is requested or ordering the services [1][2]. Also referred to as ride sharing are services that let users book and pay for truck services using smart phone apps. The term goods as used above refers to any form of an agricultural product sent by a ride-sharing service provider and does not necessarily refer to a parcel [3]. AI is used in

autonomous robots and drones to perform tasks such as seeding, spraying, and harvesting. These robots can navigate fields, make decisions based on real-time data, and work with precision, reducing labor requirements and increasing efficiency.

AI can analyze large volumes of data, including images of plants, to identify diseases accurately. Machine learning algorithms can learn patterns and symptoms associated with specific diseases, enabling early detection and timely intervention. AI algorithms can process historical weather data, satellite imagery, and climate models to provide accurate predictions. This information helps farmers plan their activities, optimize irrigation, and adapt to changing weather conditions, thereby reducing risks and improving resource management.

AI can improve logistics and supply chain management in agriculture. It can analyze market demand, optimize transportation routes, predict crop yields, and automate inventory management, ensuring timely delivery of agricultural products to consumers. Crop Breeding and Genomics: AI algorithms can analyze genetic data to accelerate crop breeding processes. By identifying patterns and relationships within vast datasets, AI can predict the traits and performance of different plant varieties, leading to the development of improved crop varieties with desirable traits.

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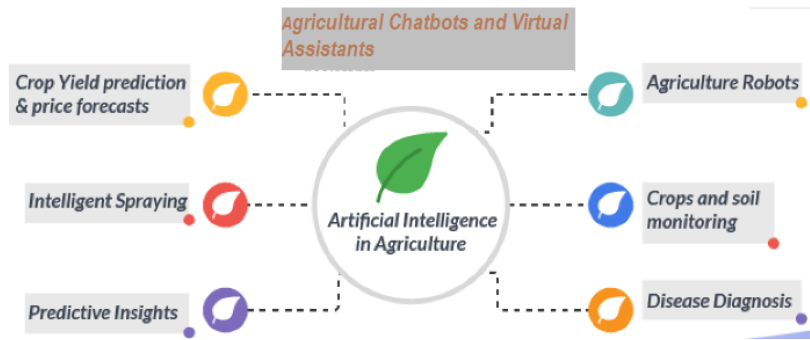


Fig. 1: Insights of AI in Agriculture

AI can assist in identifying and managing weeds and pests in crops. By analyzing images of fields and using machine learning algorithms, AI systems can differentiate between crops and unwanted plants or pests. This enables targeted and precise application of herbicides or pesticides, reducing the overall use of chemicals. **Soil Health Monitoring:** AI can analyze soil data, including nutrient levels, pH, moisture content, and organic matter, to provide farmers with insights into soil health. This information helps optimize fertilizer application, irrigation schedules, and crop selection, leading to improved soil fertility and reduced environmental impact.

AI-based systems can monitor the health and behavior of livestock, detecting signs of illness, stress, or abnormal behavior. This allows farmers to intervene early, provide timely treatment, and prevent disease outbreaks. AI can also analyze data from wearable devices, such as collars or tags, to track animal movement, feeding patterns, and reproductive cycles. **Farm Management Systems:** AI-powered farm management platforms integrate data from various sources, such as weather forecasts, crop sensors, machinery, and financial records. By analyzing this data, AI systems can provide farmers with real-time insights and recommendations for optimizing farm operations, resource allocation, and financial planning.

AI-driven chatbots and virtual assistants can provide farmers with instant access to information and expert advice. They can answer queries related to crop diseases, pest control, weather conditions, market prices, and farming practices. These AI systems help farmers make informed decisions and troubleshoot problems more efficiently.

AI can enhance food quality and safety by analyzing data from sensors, cameras, and other devices throughout the supply chain. It can detect contaminants, spoilage, and quality defects in agricultural products, ensuring that only safe and high-quality food reaches consumers. **Predictive Analytics for Market Demand:** AI algorithms

can analyze historical and real-time data, including market trends, consumer preferences, and economic indicators, to predict market demand for agricultural products. This helps farmers plan their production, adjust crop selection, and optimize pricing strategies to meet market needs effectively.

AI can assist in assessing and managing risks in agriculture. By analyzing historical data, weather patterns, and satellite imagery, AI systems can provide accurate risk assessments for lenders and insurance companies. This enables customized financial products and insurance coverage tailored to the specific needs of farmers. By connecting sub-segments where farmer's commodities can be picked up and dropped, the method can detect truck pooling or haring availability. Appropriate vehicles are selected based on openings and routes with end points near the best route's starting point, transport passengers with no vacancies and have routes with endpoints near the ideal route's starting point, or are idle and have places near the optimal route's starting point where user Farmer characteristics such as the number of goods and vehicles are utilised. There is another important aspect that is used to pool the farmers, the nearest market destination they choose [4][5].

II. Existing Methods

Agricultural product marketplaces, which include the purchasing and selling of farm products in rural marketplaces, market yards, and sub-yards have proliferated across the country. By Kahlon, A.S., and Agricultural product controlled markets, led by M.V. George, have been critical in ensuring the efficient Food grains, oilseeds, fibre crops, fruits and vegetables are distributed to meet the supply and demand needs of the state's farmers, merchants, processors, and consumers [6]. Farmers selling their produce in regulated markets receive 8 to 10% higher prices and a b, According to a study, farmers selling their produce in rural, village, and uncontrolled wholesale markets receive a higher percentage of Farmers selling their goods in supervised

wholesale markets earn more rupees than consumers. Farmers' profits from the selling of agricultural produce in a controlled market differ from one region to the next due to variations in the distribution of regulated markets among areas, as well as the availability of essential infrastructure /facilities in these regulated markets [7][8].

By the end of March 2011, the country has 7157 agricultural produce regulated markets. The distribution of these controlled markets throughout the state's districts is uneven. The average geographic region serviced by each regulated market is also important. Significantly between India's states. It ranges from 103 square kilometres [9].

Market in Punjab to 129 square kilometers per market in West Bengal, 156 square kilometres per market in Haryana, 05 square kilometers per market in Andhra Pradesh, 347 square kilometres per market in Assam, 350 square kilometers per market in Maharashtra, 383 square kilometres per market in Karnataka, and 394 square kilometers per market in Uttar Pradesh. In Arunachal Pradesh, Himachal Pradesh, Meghalaya, Sikkim, and Uttaranchal were among the states where each market served an average area of over one thousand square kilometres. Each market covers an average of 28983 square kilometers. According to the National Commission on Agriculture's suggestion, there should be one market for an area of 80 square kilometres. As a result, there is a 34679 market shortage, and with the More market places in various states must be promoted. In terms of total regulated markets, specialist markets such as fruits and vegetables have a small share. Only a few states have distinct wholesale controlled markets for fruits and vegetables. Their availability is less than one per thousand square kilometres of land. Even the horticultural states, which produce over 20% of all fruits and vegetables, have only for every 100 sq.km of land, there is one controlled market, according to Jairath,

M. S. (1996). Furthermore, markets, which are designed specifically to handle fruits and vegetables, do not have enough capacity to handle the complete amount of product that is readily available in the area [10-11].

The majority of regulated marketplaces still lack adequate infrastructure for handling produce, such as room for auction platforms and a shortage of storage and godowns on the site, limiting dealers' effective participation. The lack of storage goes down at the market level exacerbates the difficulties faced by Traders in general, and commodities in continuous flow in particular. Shet koori jackets, Apni Mandi (Punjab), Rythu Bazar (Andhra Pradesh), Uzahaver Shandies (T.N.) were recently implemented by several State government as a process of direct selling by manufacturer s to customers across the country. However, the Government of India has only encouraged these marketplaces in the state capital, as well as a few district offices around the state capital (2001). A producer–first seller's point of contact for a rural periodic market/shop is where he cashes in his agricultural produce and revenue. In total, the country has 27,294 rural periodic markets [12-14]. The Government of India has failed to provide the bare minimum of infrastructure in these rural periodic markets [15-16].

III. Proposed Method

We are going to create a mobile app for farmers and transport service providers. By this, we can pool the farmers according to their requirements. Both the farmers and service providers need to create an account at their first entry-level which asks for a username, phone number, address, password, vehicle number (for service providers). These can be made available in their native language by giving their language preference. Once registered both can use their login ID which asks for a username and password to login into the app.

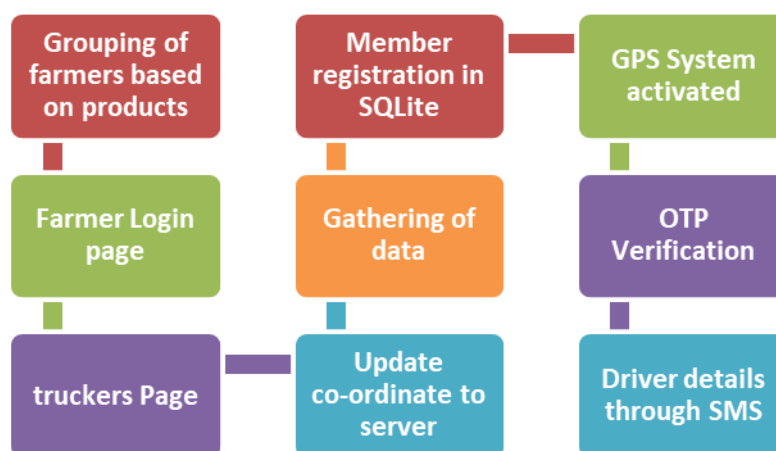


Fig 1: Process flow of the proposed work

After login into the application, the farmer to use the app, you must complete the instructions. Enter the pickup location of the agricultural produce and then enter the destination (market). Enter the product type and the weight of the produce. Choose the type of transport (Depends upon the produce and its weight). The driver will be allocated and the farmers will get a notification through SMS. The farmers are then allowed to choose the payment method either online or by hot cash.

Even farmers can locate tractors required for field grooming. Tractors are a fundamental tool in modern agriculture, used for plowing, planting, and harvesting crops. They can also be equipped with various attachments to perform other tasks, such as tilling, spraying, and transporting goods within the farm.

Specialized machinery, such as combine harvesters, are used for harvesting crops like wheat, corn, and rice. These machines not only speed up the harvesting process but also handle the threshing and winnowing of grains, reducing manual labor requirements.

Trucks and trailers are essential for transporting agricultural produce from the farm to processing facilities, markets, or distribution centers. They help ensure that perishable goods, like fruits and vegetables, reach their destinations quickly to maintain freshness. Livestock such as cattle, pigs, and poultry may require specific transportation methods. Livestock trucks and trailers are designed to provide appropriate conditions and ensure the animals' welfare during transportation to markets or slaughterhouses.

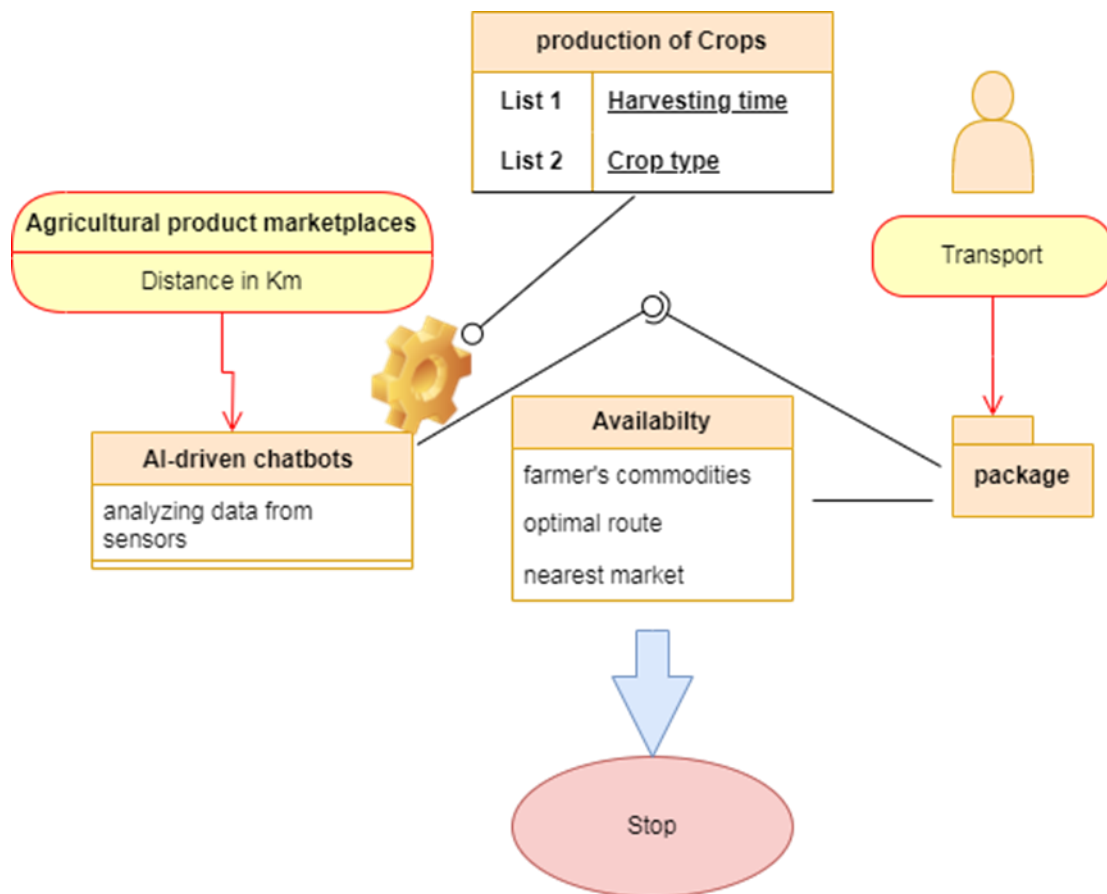


Fig 2: Block Diagram of the proposed work

Then ratings option is available after the end of the journey. Operating System used differs between Windows 8,9,10. Front End tool is Android Flutter. Backend is SQ Lite and Firebase. Flutter Package includes Google map location picker 4.1.7, Live Location 1.0.1 and additional functionalities like Google map API.

IV. Results and Discussion

The android app which we developed was using the Android studio. It can be used in several of Operating

systems based on Windows, Mac OSX, and Linux. The application is built on the Java platform. The app consists of 7 layouts. The following layouts used in the agro app are the opening graphics, user log in and authentication, user information, and details, profile creation for truck holders, g-maps for tracking the truck, community page. The UI and colours, which we have used in the app nature theme and agriculture background. Also, we have used unique and bold fonts, we have also included Google services to support native Indian languages in our app for the benefit of rural farmer users.

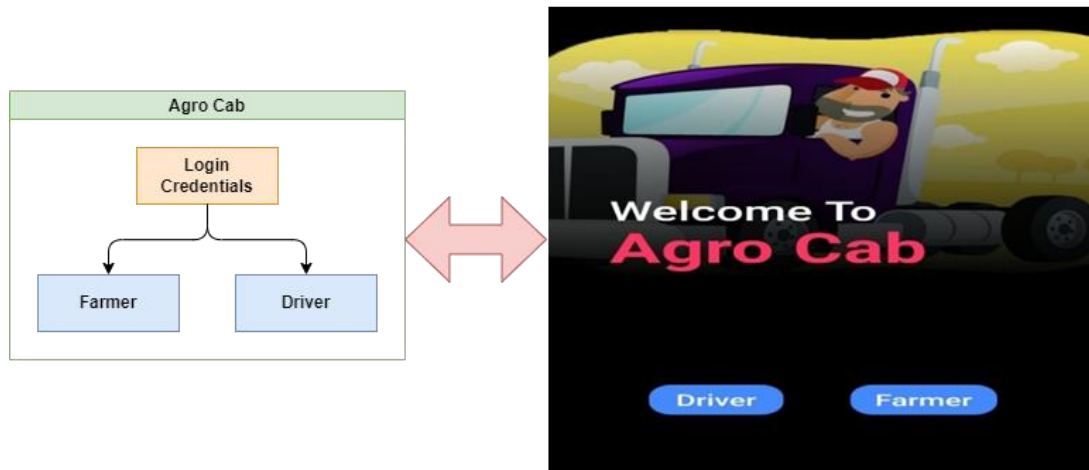


Fig 3: Application Schematic

SQL (Structured Query Language) is a database query language designed specifically for use with relational databases. The majority of the time, it's utilized to manage and alter data in our databases. Some of the important data we store is farmer's and users' profile information, their travel history, past transactions for the ride. These are some of the pieces of information stored

in the database that is to be displayed in the app. Here these data are manipulated or fetched by SQL. Wherever possible, SQLite will attempt to translate data across formats, in this case, the string "123" into an integer, but such conversions are not guaranteed, and the data will be stored as-is if such a translation is not possible.



Fig 4: Member Registration – SQLite

Google APIs are application programming interfaces (APIs) developed by Google that allow users to connect with Google Services, and we may utilize them by integrating them into our application. In the agro app, we have incorporated one of the Google APIs called the google maps API, which is here used or helps in for pooling or merging the users based on their locations and

the destination they choose. The APIs provide analytics, machine learning as a service (the Prediction API), and user data access (when permission to read the data is given). Another good example is a Google map integrated on a website, which can be done with the Static Maps API Places API or the Google Earth API.

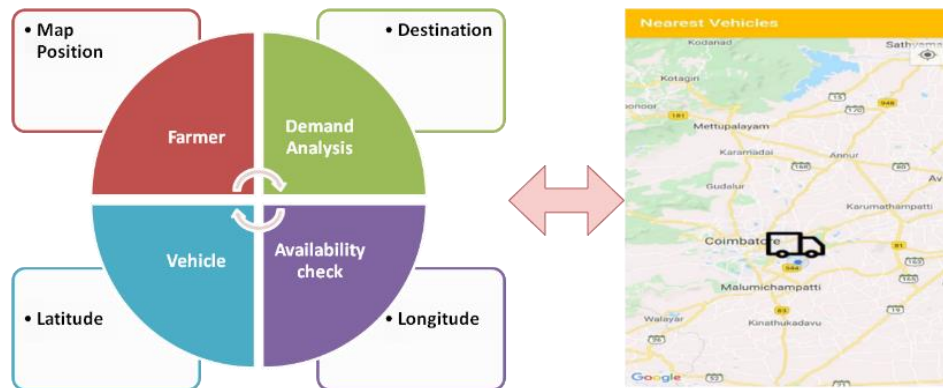


Fig 5: Vehicle tracking status

The Maps API delivers useful information about locations and places. JavaScript is the name of the language. It accomplishes two important goals: It has the

ability to bring up maps for the user. It can return information about latitude and longitude, location, or an address.

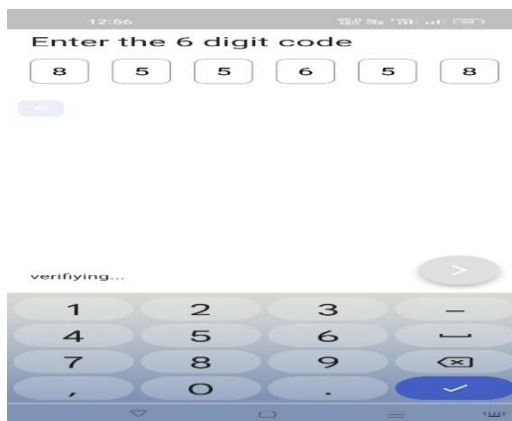


Fig 6: OTP Verification

They can help farmers make informed decisions about their fields and improve productivity. In some traditional agricultural practices, animal-pulled carts are still used for transporting small quantities of goods and materials within farms or rural areas. Adequate rural road networks are essential for facilitating the transportation of agricultural produce and equipment between farms and markets. Efficient agriculture-based transport is crucial

for the success and sustainability of the agricultural industry. It not only helps farmers to manage their resources effectively but also ensures that agricultural products reach consumers in a timely and cost-effective manner. As technology advances, the agriculture sector continues to explore innovative ways to optimize transportation methods for greater productivity and reduced environmental impact.

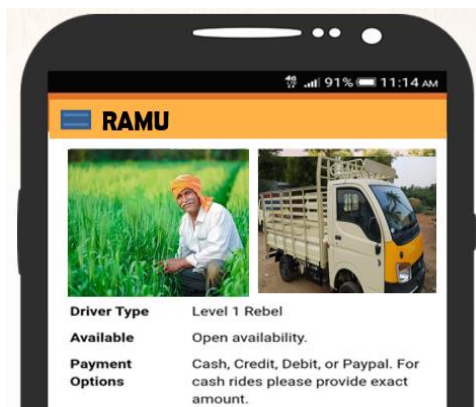


Fig 7: Driver details

V. Conclusion and Future Scope

In many developing countries, inadequate transportation infrastructure remains a significant challenge for the agricultural sector. Poor roads, lack of storage facilities, and limited access to markets can lead to post-harvest losses and reduced income for farmers. Seasonal fluctuations in agricultural produce often create surges in transportation demand, requiring efficient logistics planning to avoid bottlenecks and wastage. Climate and weather conditions can affect transportation, especially during extreme events like floods or storms. It can disrupt supply chains and delay deliveries. This paper strongly discuss about the android application for sharing the transport for agricultural products to reach market. The speciality of this paper is an Android application is generated which supports this purpose. To develop Android application that can be accessed by the truck holders and farmers, a specified community page can be created. You have a page termed as Agro cab is developed and member registration can be done in the practical application. The Farmer will be provided with OTP verification. Once the data is fetched, the farmer will be given with driver details. This application helps the farmer to safely transport their produce to the required part through the available transports.

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