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A CASE STUDY OF VIRTUAL ASSISTANT AND EFFECTIVE IMPLEMENTATION FOR ASSISTING THE FARMERS

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Abstract-
Virtual Personal Assistant (VPA) is one of the most successful results of Artificial Intelligence, which has provided an opportunity to get the work done through the machine. Most Virtual Assistants (VA) work basically on voice as communication. Looking at the potential advantages of VPA, the use of virtual assistants is increasing in all fields. However, there are still a few sectors in which the use of virtual assistants is still at a very primitive stage. Agriculture is one such sector where there are several tasks that virtual assistants can assist in to improve the overall economy of a country. An online conversation regarding farming is picking up speed and is need of time. Indian farmers adopt voice-based mobile applications to access sowing advisory services, price forecasting models, and weather forecasting models. A young farmer who needs advice on crop diseases either uses search engines to seek the guidance and find the information or waits for an opinion from the expert in agriculture domain. Farmers are compelled to wait until the experts respond to their questions because there aren't enough agriculture professionals. An automatic answering method can be used to tackle this problem.

Keywords— Virtual Assistant, Farming, Natural Language Processing, Artificial Intelligence, Chatbot

I. INTRODUCTION

One of the most useful applications of Artificial intelligence is Virtual Personal Assistant (VPA). This has provided a new method for people to complete tasks using computers. Voice assistants are the agents which make use of artificial intelligence to assist users in finding information, making decisions, or carrying out specific activities using spoken natural language. Most Virtual Assistants work basically on voice as communication. It is concentrated on processing auditory signals, turning them into text, and carrying out the necessary task. Voice assistants have a many uses like speech-based search, automation, HR related activities, and help desks. The majority of future generations needs will be met by voice assistants.

The voice assistants that are in the market each have distinctive features and some commonalities. They can complete the following fundamental tasks: set calendar entries, timers, reminders, alarms, etc.; build to-do lists, perform simple math calculations; manage the playback of media from connected services; operate connected devices; Read news, tell stories, jokes, etc [48][36].

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A relatively small number of 'built-in' commands and corresponding responses are used by voice-activated tasks/ devices/applications. Voice assistants may now quickly produce intelligible responses because of recent developments in computational linguistics and natural language processing [48]. Compared to employed voice-activated systems, voice assistants can generate the response to a considerably wider range of instructions and queries. The assistant analyses the user's voice requests and responds appropriately. Text input and output is comparatively effective since the user may check for errors and recheck the input if necessary. However, providing text input takes time. Therefore, the voice interface with speech recognition technology is considered to be a better option. This approach enables the application to converse with the user [2].

The job of a virtual assistant based on voice is defined can be divided into three stages: Speech to Text; Text to Intention; Intention to action;
Three key areas are emphasized by recent research on voice assistants [29]:
(a) enhancing the technology that powers these gadgets in order to give them improved voice recognition, the capacity to grasp different languages, the ability to produce speech that sounds human-like, and the ability to express emotions.
(b) enhancing privacy and security so that users can rely on them for daily use.
(c) theoretical study concentrating on the elements and research models that describe how these gadgets are used.

II. AREAS INVOLVING VIRTUAL ASSISTANT

Chatbots are used in numerous public and private applications. To understand the areas of implementation, acceptance, technology used, and future research different papers describing the design and evaluation of virtual assistants were studied. The prominent areas where the successful implementation of virtual assistants is employed or there is possible scope for implementation and improvement are mentioned below.

A. Smart Tourism

A travel bot is computer software created with the intention of simulating conversation between human users and a machine using text or audio input. The majority of modern travel bots imitate human chat conversations by using instant messaging as the application interface. These travel bots primary method of functioning is identifying catchwords users enter and generate pre-written responses that advances the chat [2]. They often work for travel search companies like Skyscanner and Expedia. Virtual Travel Assistants is a customer service travelbot that is integrated into a travel booking website [3]. Face & Slack Travelbot: These chatbots are more quick-witted than other travel bots because they really assist you in booking travel through chat conversations rather than just telling you where to find it on a website

B. Healthcare Solution

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Three crucial parts make up the medical interoperable system: the voice application, online service, and medical cloud [1]. The voice application communicates with the patient by taking voice commands using a voice-enabled device or smartphone. Each command query is examined, and depending on the request, a service action is executed. A code segment is run in each service activity to interact with the created web service. A heart condition checker, delivering a report of the heart state, setting up arrangement and a therapy reminder are among the voice services that are highlighted[29][5][8]. Fig 1. Shows the general diagram of Voice Assistant Healthcare Solution.

Virtual Diabetes Physician is a chatbot specialized for diabetes teaching. The past queries and responses result in a response relevant to the topic of the present discussion [19].

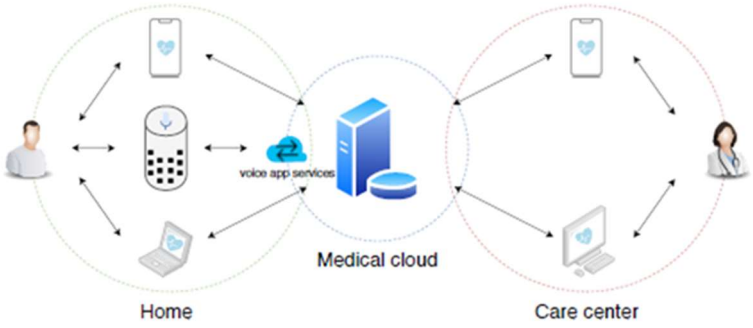

Fig. 1. Voice Assistant Healthcare Solution [1]

C. Robotic Assistant

Robotic personal assistants reduce the physical labour of people and can perform daily routine activities on regular basis. The camera is used to detect objects, estimate distances, and control a robotic arm to pick and position objects. It has a wide range of uses, including in the chemical industry and in the care of the aged and disabled. There are many uses for voice-controlled robot vehicles, including military, surveillance, and human use [31]. Voice-control personal assistant robots are used to do tasks for the elderly or physically disabled and cannot be accomplished without adequate assistance[23]. By identifying the items that older people use and teaching the gripper how to hold those items, a custom-made robot can be created [11]. Decreased hand functioning in patients having injured spinal cord is frequently linked to a poor life interests and restricts the freedom;patient is unable to complete the majority of tasks on own. Rehabilitation of patient can be accomplished using Robotic exoskeletons which can help with recovery of hand function [18]

D. Home Automation:

The IOT module is set up to work with a unit that manages the controlling of household applications including lights, televisions, and air conditioners. The user can engage in real-time speech dialogue, play music, provide weather and traffic updates, as well as other information like news. The above-mentioned system has a variety of technical benefits like the development of an

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intelligent and secure system; as individual authentication can also be integrated into the system[46]. Since the virtual assistant industry is developing at a fast pace, rural residents can also have more opportunities for connectivity and interaction with the outside world [28].

E. Inquiry chatbot for websites:

When someone is not familiar with the internet resources or is looking for typical information from a particular site getting information quickly and accurately is challenging. The solution to this is an inquiry chatbot, a quick, standardized widget that improves the user experience on websites and gives them useful information. This could be a spoken or text-based conversation [3][7]. E.g. College inquiry chatbot can do the tasks like: Providing answers to questions about how to apply for a particular course; Accessing user profiles, to view attendance information and grade/point information.; find out information about upcoming exams and placement events, etc. [25]. The bot will assess user inquiries, comprehend user messages, and then respond appropriately.

F. Voice-Based Assistants in Hotel

The use of voice-based technology in the hospitality industry is mostly untapped. It is evident from this study that both hotels and visitors benefit more from the adoption of modern technology for automation and assistance in various routine activities. The results show a variety of advantages of voice-based human-computer interactions. Prior knowledge of AI and a sufficient comprehension of their prospective advantages will have substantial impact on lowering ambiguity and approval of smart services in the hotel and hospitality industry. [21]. Hotels will need to make sure that their systems are unified and interoperable inside the IoT infostructure in order to fully take use of their potential. The results pointed to multilingualism and modulated offerings as the future directions for speech technology in the hospitality sector, which will secure the general adoption of this technology in the sector[10][6].

G. Customer Care

Improved customer experience and, consequently, better customer relationship management are the goals of adopting a chatbot. Customer knowledge should be well handled in order to establish and maintain good customer relationships [26][4]. Fig. 2 shows the distribution of message type in customer service application.

H. Educational Purpose: As a learning assistant or Learning tool for Specially able children

The robot serves as a teaching tool that assists pupils in reading stories, correctly spelling words, and answering a specific math question. The findings demonstrate that using robots as tutors makes it easier for students to absorb challenging material in their native tongue and to take part in instructional video games [16]. Additionally, robots improve problem-solving strategies and encourage active learning, which may fit current educational initiatives and swiftly improve and update the course materials[24][25]. The main conclusions with regard to learning are: (1) robots can assist people in learning language; (2) robots are not able to deal with training the vocabulary

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contents more effectively; study shows that existing technology is at par with human training; (3) The evidence suggests robots have a good impact on learners when employed in conjunction with human instruction[17][20].

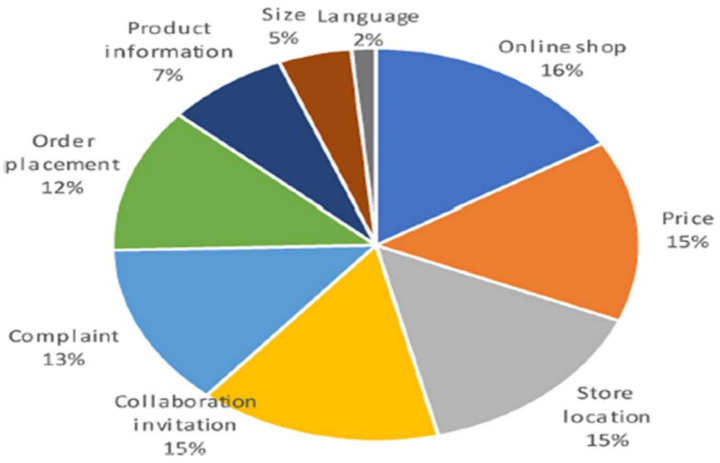

Fig. 2. Distribution of message type in customer service application [26]

I. Farming

The biggest source of support for the country is agriculture. Since farmers are the foundation of the nation, it is crucial to meet their needs and encourage them to enhance crop production, which would boost the nation's economy [35]. Farmers employ voice-based mobile applications to access services including sowing advisory services, price forecasting models, and weather forecasting models. Young farmers who require advice on crop diseases either wait for an agriculture specialist to be available online or use search engines to find the information [49]. Farmers lack a centralised resource to answer all of their questions about various important things they are needing to perform there routine activities. This data can be made easily accessible to the farmers through a virtual assistant which can handle all the queries. Deep neural networks are now a common tool in agriculture, helping farmers boost their crop production by using weather monitoring conditions. Recurrent Neural Network (RNN) is used to identify the crop that is best suited for the field's observed environmental conditions and to provide recommendations about whether the intended crop can be produced there or not [47].

III. METHOD OF INTERACTION IN VIRTUAL ASSISTANTS

A. Text based - Chatbots

Chatbots are programs which establish the communication with the user with the help of natural language. The chatbot stores and gets the data from a database in order to recognise sentence keywords, choose a query and offer an answer. They are used for marketing, assistance, sales and support conversations and brand engagement [22].

There are two types of chatbots [37]:

i) Rules-based, which operates by using particular commands (or phrases) and

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ii) AI-based, which employs more sophisticated technologies like machine learning and natural language processing to enhance dialogue and interaction capabilities.

Based on the intended use, chatbots are divided into two categories task-oriented and open domain dialog system.

Task-oriented (declarative) chatbots are able to solve administrative chores. They have only one function and one purpose. They react to customer inquiries in an automated yet natural-sounding manner using rule-based, NLP, Machime learning. This kind of chatbot lacks deep learning capabilities because it is highly structured and applies just to one function. Task-oriented chatbots can handle routine, frequent inquiries like company hours and other requests that do not require variables or decision-making. The task may involve ordering something, planning an occasion, or troubleshooting. Its key benefit is the replacement of humans in industries with task-oriented bots [9]. They may employ NLP, but not in a proficient or perceptive manner. These simple chatbots are incredibly commonplace today [26].

Without having any specific objectives, conversational or open domain dialog system bots try to mimic everyday conversation to amuse the user. The level of the bot's performance increases with how much it can indulge the user.

B. Voice Assistant

Voice assistants are software programs or intelligent units that respond to audio commands. The system operates in both text and voice modes. It is a digital assistant that uses voice recognition, speech synthesis, and natural language processing (NLP) and also AI to provide an amazing service through the various applications [36].

Fig 3. depicts the model of voice assistant. A microphone is used for user input. The speech recognition algorithm will convert the phrases and words in the spoken language to the text. This is further acting as input to NLP, a field formed by combining computer science and artificial intelligence. The goal of NLP is to enable computers to comprehend spoken and written language in a manner similar to that of humans. The voice assistant performs the action and acknowledges it to the user via a synthesized voice. If it is a question, however, the algorithm searches a dialogue box or knowledge base before responding to the user via a synthesized voice [51].

The need for multimodal dialogue systems is growing because product images transmit a huge amount of visual semantics [30]. To be more precise, the multimodal encoder outputs the utterance vector after receiving multimodal utterances from the user. After having glimpse of the image and the dialogue history, readers naturally return to specific sub-areas of both the image and the text to further understand the multimodal context. Recurrent Dual Attention Network (ReDAN) which uses multi-step reasoning for visual dialogue is suggested [27].

In fig. 4 the dialog processing for an image based input is shown. This mode is popularly used in online shopping.

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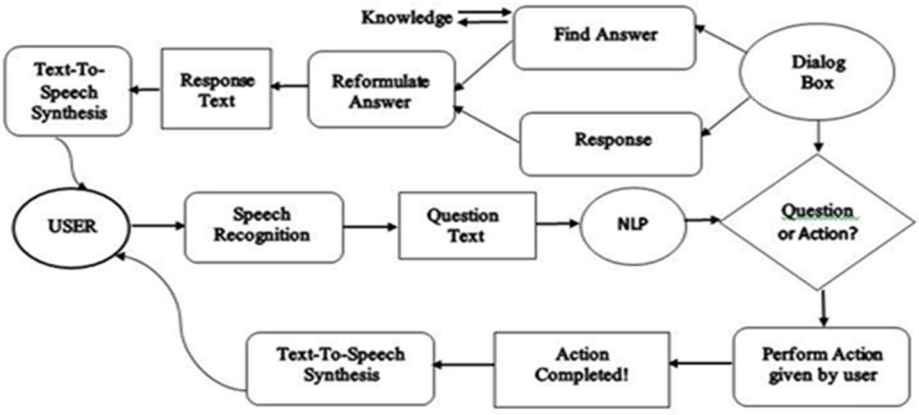

Fig.3. Model of Voice Assistant.[51]

C. By taking and/or uploading images (Multimodal Dialog Systems)

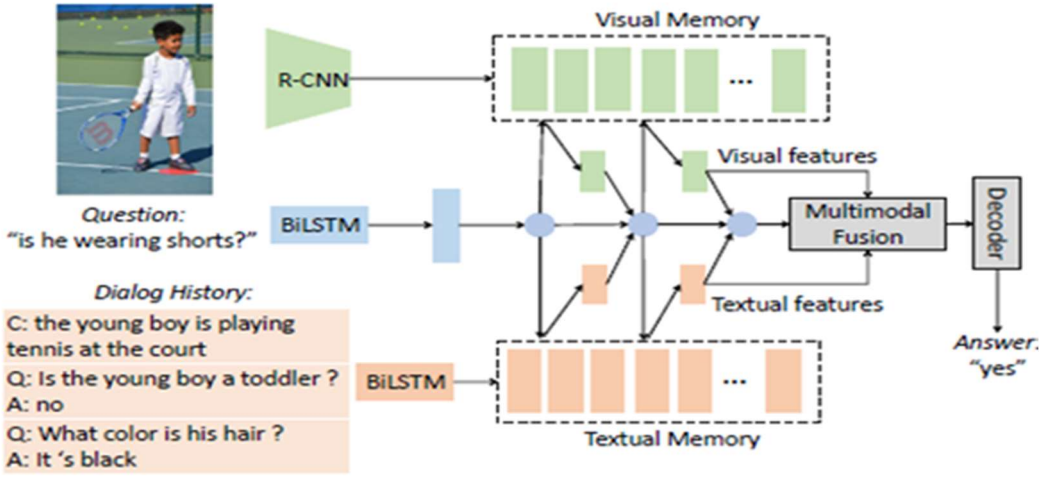

Fig.4. Multimodal Dialog System [27]

IV. ROLE OF VIRTUAL ASSISTANTS IN THE AGRICULTURE DOMAIN:

Agriculture is the biggest source of economical support for the country. Since farmers form the foundation of nation, it is crucial to meet their needs and demands; encourage them to enhance crop output, boosting the nation's economy. 54.6% of Indians are farmers, however they only contribute 13.9% to the country's GDP [38].

By enhancing farmers access to knowledge and professional guidance, this vast difference can be reduced.

Todays era of smart applications has provided farmers an access to information which enables them to monitor various agriculture related parameters and make them available locally at their place. Farmers can considerably improve the efficacy of fertilizers, pesticides , apply them selectively by properly measuring changes in field. In a similar manner, farmers can improve herd

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health and prevent disease by adopting Smart Farming techniques to better monitor individual animal needs and change diet accordingly.

Artificial intelligence (AI) is becoming more prevalent in agriculture. The application of this technological advancement may be divided into three basic divisions.

• Agricultural Robots - to replace humans with machines in labor-intensive jobs

• Soil , Crop monitoring: Use computer vision and deep learning algorithms to monitor the health of the soil and the crops.

• Predictive Analytics: To track and foresee how various environmental conditions, such as changing weather patterns affect agricultural productivity.

Digital technology is applied in agriculture in a wide range of ways. The following list includes a few instances and options[34].

• AgroPad: AI-powered tool that helps farmers assess the condition of their soil and water. It is a paper based device that is of the size of a small card. In less than 10 seconds, the chip inside the card does the chemical analysis of the sample on the spot.

• Plantix11: It is a smartphone application created by the German startup PEAT that has a big library of images of diseases affecting the various plant that can be used for comparison. This aids in identification, followed by diagnosis and therapy.

• Trringo13 and EM3 Agri-services are leading rental service for farming related equipment.

• The "Swamitva18 scheme," introduced by the Indian government, makes use of drones to create a digital map of every property falling within a village's boundaries and mark the boundaries of each revenue region.

• Ergos' Grain Bank Model is among the most distinctive in the Agri-tech market. It gives small and marginal farmers doorstep access to complete post-harvest supply chain solutions, allowing farmers to transform their grains into exchangeable digital assets.

• AgNext developed the technology platform Qualix, which can quickly evaluate safety standards for a variety of commodities and also check the trade. It serves as a platform for the quality assessments of the agricultural products.

• Agritech firm Yuktix Technologies is situated in Bangalore and specializes in developing digital tools for risk management and farm monitoring.

Farmers currently have limited knowledge of modern techniques and technologies employed in the agricultural sector. Machine learning professionals and sophisticated machine learning approaches of extracting meaningful answers using machine learning techniques needs to be explored. There are technologies that can explore online data, with agriculture as a specific domain in mind, but it is not possible to get an exact answer through this. Using Recurrent Neural Network (RNN) technique more precise response can be generated. In order to get precise answer to the questions about crops, raw materials utilised, plants growing in a particular area, use of pesticides and fertilisers, etc., there is need of research [43].

V. A REVIEW OF RECENT WORK ON DESIGN OF VA FOR FARMERS

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The estimated world population of almost nine billion in the 2050 will require an increase in agricultural production of 70%. The market requires high-quality food, to meet this need current agricultural technologies require substantial improvement. Lack of labour, increased labour costs, crop failures by pests, a lack of rain, climate changes that have reduced soil fertility, and shifting market prices for agricultural goods. On the other hand, the demand for food grains has increased in response to the growing population, pushing up the price of agricultural goods [47].

Artificial intelligence can be used to enhance smart farming techniques to reduce the loss and boost productivity. Using AI-ML techniques an enormous amount of data gathered from public and governmental websites as well as from the IoT (Internet of Things), can be precisely evaluated to assist farmers in resolving unsolved problems they confront in the agriculture sector[47].

The use of datasets is crucial in artificial intelligence. One of the elements that affects the system's effectiveness is the sort of training. Dataset quality affects training quality [38].

Obtaining the required dataset is the major problem in the field of agriculture. Fig 5. Shows Smart assistant for crop recommendation. Once the clear and authenticate database is available, through machine learning algorithm the various queries of the farmers can be given solution and also suggestions regarding best suited crop, best time to harvest can be provided. Fig. 6 elaborates the flow diagram for crop prediction.

For prediction of best suited crop in a particular region, the information about the geographical location, historical information about the crop taken previously and its corresponding yield will be key components. Once this information is available, by the applying various machine algorithms the prediction about best suited crop can be done.

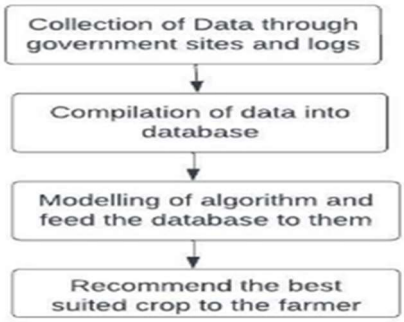

Fig. 5. Smart assistant for crop recommendation [33]

Amongst the various paper which have implemented the Virtual assistant system for the farmers most of the authors have worked on designing the text-based system.

In 2018, L Kannagi et.al proposed a virtual assistants that can carry on a conversation with consumers automatically. The dataset file containing hundreds of agricultural queries and their corresponding responses are imported. To give voice-based responses, the system makes use of the speech synthesis Web API.

In 2018, T.Cynthia et.al designed a conversational answering system which enables the farmers to get relevant answers to their queries. A dataset about infections that affect tomatoes is created and all possible query formats the user can ask is used to for train the system. In 2018 Mohit Jain et.al

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carried out a review of around 35 farmers in the locality of Ranchi, with the goal of evaluating the system usability and understand the challenges faced in utilising the technology. Comparison research of the two alternative modes using audio-only and audio+text is presented. The system was designed to handle the queries in Hindi since it is most widely spoken language in India.

In 2019 Divya Sawant et,al developed a web-based user interface that features an interactive chatbot which can reply to user inquiries about godowns and warehouses for the storage of crops and offers details about training facilities nearby. Voice input is also supported by the chatbot.
In 2020 Bhavika Arora et.al proposed a chatbot with artificial intelligence (AI) that will assist farmers in making decisions by offering answers to a variety of farming-related challenges. The bot focuses on agricultural disease identification and weather predictions in addition to answering frequently asked questions.

In 2021 Dr.S. Geetha et.al proposed a platform independent bot; a comprehensive conversational system solution, integrating a number of prediction modules, including those for crop identification, crop disease detection, crop rotation advice, soil detection and weather forecasting.
In 2021. Kiruthiga Devi et.al created a mobile application of multilingual chat bot to help farmers. The farmer will have access to localised information such as weather forecasts, the optimum crop for planting, and fertiliser, as well as agricultural information.

Table 1 Nature Of Inputs The Virtual Assistant Used In Agriculture Domain Can Process

Author and year	Text	Audio	Image	Video	Regional Language
[32]	√	X	X	X	X
[39]	√	√	X	X	X
[49]	√	√	X	X	X
[38]	√	√	X	X	√ (Hindi)
[33]	√	√	X	X	X
[37]	√	X	√	X	X
[35]	√	X	√	X	X
[47]	√	√	X	X	√

The table 1 reflects that the existing conversational agents can handle the queries mostly in English language. For disease prediction and guidance on it, there is need of a system which can handle the image and voice-based queries.

The work done by different researchers in field of development of Conversational agent/ Virtual assistant in the field of farming was studied. Total 11 research papers were referred. The papers include 6 conference papers and 5 journal papers from IEEE, ACM Digital Library, Science Direct, etc. The Table 2 summarizes the Work done by author and methodology used.

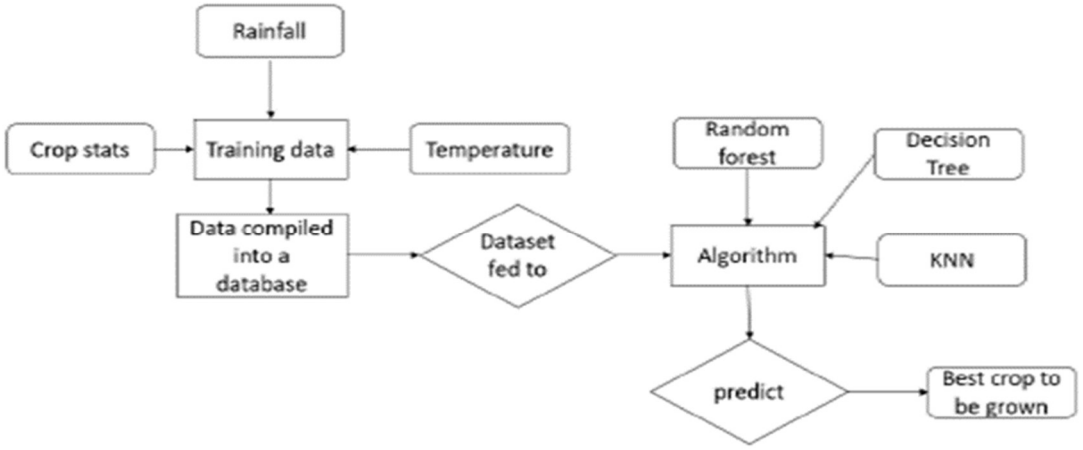

Fig.6 Flow diagram of the system [33]

Table 2: Overview Of Implemented System

Sr. No	Author and year	Related Work	Methodology
1.	[32]	Virtual assistant that assists farmers by responding to their questions about agricultural techniques and assisting them in earning more money.	The Django framework and chatterbot libraries to implement the chatbot. jQuery, JavaScript, HTML, CSS, and AJAX used to build the front end.
2.	[33]	Assists the farmers in choosing the best crops based on the current weather, soil conditions, and geographic features of the given region.	data collection from government websites and logs, data compilation into databases, algorithm modelling use of the machine learning algorithm for processing queries, designed a web interface
3.	[34]	explains the benefits and problems of digital agricultural methods in India.	The survey of the numerous tools and technologies created to help digital farming.
4.	[35]	Conversational system incorporates prediction modules for soil and crop detection, disease identification, recommendations for rotation in crops, forecasting of upcoming climatic conditions and direction for decision-making.	crop detection and disease identification on crop, soil detection are performed using the object detection method YOLO V3.
5.	[37]	Chatbot with artificial intelligence to solve farming-related issues, identify crop diseases, and forecast the weather	KCC dataset and the blog's FAQ on agriculture; The OpenWeatherMap API is used to predict weather; using the plant village dataset to train a plant disease detection module; sequence learning and the construction of a conversational system model; digital messaging service Telegram is used.
6.	[38]	Alternative modalities - Speech Plus text,Speech only- were utilised to examine the system's performance, with a focus on adaptation and usability.	To meet the knowledge and information requirements of rural farmers , scalable cloud-based services were used to construct a conversational agent.
7.	[39]	Farmers asks questions about agriculture, receive answers in text and speech, and also aids in forecasting future price data.	The dataset file with the questions on agriculture and the answers is imported. In order to train the bot, a neural network is built. The ARIMA method is used to estimate the price of products in future.
8.	[40]	Investigate the effectiveness of the government's telephone-based agricultural extension system	Along with partner organisation,a total of four randomised control experiments were conducted over a four-month period with the goal of enhancing the experience of the users and expanding access to agricultural assistance.
9.	[41]	Examine how Industry 4.0 technologies will affect agriculture businesses.	Global issues in this field are evaluated, and several digital solutions used to increase agricultural productivity are described.
10.	[47]	studyof existing chatbot technology with a comparison of the benefits and cons of each system and suggesting a system that is superior.	Answers are extracted using a SPARQL query, a rule-based text-related system, supervised machine learning methods, and the RNN sequence-to-sequence algorithm.
11.	[49]	To provide information regarding tomato crop diseases in response to voice or text requests.	"integration Service" supplied by DialogFlow called detectIntent API to combine this service with Google Assistant.

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According to technique proposed by Vandana Nayak et.al. [2021] keywords in the query might be questions. The desired result is obtained regardless of the order or jumble of the query string. The keywords in the fired query have an impact on the system's accuracy; if there is a one to one match, accuracy is good. However, accuracy decreases if the keywords do not match. Accuracy of the proposed system is 96%. The author claimed that making the chatbot capable of responding with both images and videos enhances its usability. It is also suggested that the application needs to be translated to a language that the farmers can understand.

Divya Sawant et.al [2019] presented a system that enables farmers to receive the best crop advice, care for crops, store the crops to extend the life, and locate the best prices at which they may exchange their commodities in neighbouring markets. An interactive chatbot that replies to user inquiries about godowns and warehouses for crop storage and gives details about training facilities in the area has been developed. Each inquiry that does not contain a keyword that has been saved is sent to the Kisaan Contact Center. The author stated that there was no single database that listed all of the topographical, economic, and climatic characteristics of an agricultural region. As a result, the implementation enables the farmer to add to the database. Also, the author asserted that using regional languages will increase adaptability.

Farmers that use T. Cynthia's conversational replying technique (created in 2019) will feel as though they are conversing with an agriculture specialist. The system was evaluated using five questions from each Factoid, List, and Yes/No type. The results were compared to those from Google Assistant and were found to be much better. Even misspelt words might yield pertinent results and increase accuracy.

The important elements that will decide the success of digital agriculture in India, according to Abhishek Beriya (2020), are technology that is affordable, simple to use and maintain, easy to access and operate, rapid grievance redress, and the right kind of legislative support. He also opined that serious study and development are required if digital agriculture is to truly benefit Indian farmers. The different suggestions that can be used in Indian digital farming are proposed by evaluating the currently available technology.

A system that can offer farmers a convenient and portable virtual interactive, platform independent farming helper was proposed by Dr. S. Geetha et al in 2021. According to the data, YOLOV3 produces processing results extremely quickly. In comparison to SSD, CNN, and Faster RCNN, it requires less processing time. Even for microscopic objects, the findings from the highly optimum YOLOV3 algorithm are as anticipated. Implementation flaws include automatic location access for weather forecasts, disease prevention strategies, and solutions.

Arora, Bhavika, et al. [2020] combined modules of conversational system, disease detection, and weather forecasting into one application. The conversational system accuracy for the training dataset was 98%, while the disease prediction accuracy on test dataset was 94%. It was proposed that the regional language support be made usable.

The study carried out by Mohit Jain et al. [2018] to comprehend the efficacy of FarmChat implementation with an aim to understand the impact of literacy and the digital literacy. The conversational system has the ability to successfully address the information demands of farmers

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on a large scale. Further data from the agri-expert can be added to the dataset to improve it. The usability of the system is constrained by limited capabilities of the various speech to text conversion API and language translators. The speech synthesis Web API is used by Mrs. L. Kannagi, et al. [2018] to deliver voice-based response. The farmer can arrange their efforts to maximise their profits by using price prediction. The standard deviation of classification errors is 0.1814%. For the retrieval of query responses, machine learning methods are applied. It is suggested to include regional language support; rainfall and production predictions can be added. A government phone-based agricultural extension system was the subject of research by Torsten Figueiredo Walter et al. in 2020. Results demonstrate that even little modifications to the interactive voice response system's architecture can significantly alter the amount of agricultural advice that farmers access. Significant system enhancements can result from adding a feedback loop between the design of service delivery systems and administrative data on public service delivery. Call logs from the system were used to analyse how the users navigate IVR system.

A V Rasputina has out a study[2021] to evaluate the effects of Industry 4.0 technology on agricultural businesses. Digital technology will improve natural resource management effectiveness, lower the environmental burden on agriculture, and boost resilience to unfavourable climatic occurrences. The digital divide between urban and rural areas in terms of Internet connectivity and a severe lack of workers with digital capabilities are the key obstacles to the growth of digital agriculture.

A mobile app developed by Kiruthiga Devi Met.al in 2021 features two sections, voice bots, and recommendation bots. A multilingual chatbot will react to the farmer's questions in their native tongue and will also provide crop and fertiliser recommendations based on the weather and soil. The implementation demonstrates the versatility of the sequence-to-sequence RNN algorithm in comparison to other machine learning methods. That takes up less time. The findings of other methods, such as logistic regression and SVM, all have predetermined output sizes and fixed input sizes, respectively. Future research will focus on identifying agricultural illnesses, their treatments, and the best plants to grow and when to harvest them based on soil, climate, and market conditions.

VI. DISCUSSION:

Chatbots are gaining popularity in all industries like customer care, healthcare, education, job assistance, etc; they are emerging as significant utility points for digital services to users and as a source of information. Unfortunately, there is lack of information which can put light on the effect of chatbots on various entities including the users, industry, utility sector and society as a whole. There is need of doing research on exploring the potential benefits of chatbots [14].

One of the most important things for success of new technology is user acceptance. Despite widely acknowledged benefits, automated assistance system involvement in applications receives a small share of customer choice. Developers can use the results of numerous studies to better understand the reasons why people use virtual assistants during interactions and to adopt such technologies effectively, particularly when aiming to appeal to younger generations.[13]

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The study highlights the necessity for additional learning to fully comprehend the function of voice based interaction as a novel mode influence in consumer behaviour. Due to its unnatural voice and inaccurate pronunciation of various dialects , the use for various locations is difficult [12]
Chatbot design and research in its effective implementation are still in relatively initial stages[14]. After the speech-to-text conversion, the processing procedures for voice and text are the same, but there are fundamental distinctions in how conversational systems are used, especially in terms of their applications. Due to its ease, text is used in the majority of research, whereas voice is employed in special needs applications, such as those for people with disabilities. Applications for disabilities should receive a voice response as response. The recently developed commercial smartphone apps (Chatbots), like Microsoft Cortana and Siri, allow speech based inputs and generate audio response alongwith text. Many methods are used to build knowledge bases.

AIML, SQL, and Relational Data Base are a few of the approaches utilized in the architecture of Chatbot, which allows the Chatbot to recall past discussion by accessing the history of the recorded messages in the database. Future development must focus further on creating Chatbots with more comprehensive knowledge bases that may be used for a variety of purposes. The Chatbots are often only available for specific applications. General-purpose chatbots require the development of more thorough knowledge bases.[15] Use of the relational database model approach to revamp the architecture of the chatbot as a whole and added the extension and prerequisite algorithm in an effort to supplement the conventional mechanism of chatbot operations[19].The foundation of virtual assistance is voice recognition, speech identification, and the appropriate response. The incompatibility with some languages is one of the problems with the virtual assistants that are currently available[42]

A. Benefits of Voice Assistant

A voice assistant has many advantages, including seamless user experience, improved privacy restrictions and simplicity of access. The important benefits are as mentioned below:

• Outstanding at streamlining and organising: Many people make use of voice assistants to check their schedules, get news, weather updates, etc. By providing with these updates, it aids in keeping an organised schedule.

• Easy navigation while travelling: A voice assistant can guide you through navigation with ease. You can use this to free up your hands and do other things. They could also entertain you while you're travelling.

• Personal assistants: By employing voice assistant tools one can accomplish the tasks without pausing what they doing and with less efforts.

• Trouble-free communication: Assists in organising the meetings, send mails, texts and complete the online tasks much more quickly than ever before.

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B. Drawbacks Of Virtual Assistant Systems

For users of voice assistants, privacy is a big worry. By their very nature, these gadgets must always be listening in order to respond to consumers. A number of additional assaults can target voice assistants. Recent research has demonstrated that voice assistants will respond to ultrasonic orders that are not audible. Security is one of the key problems with these voice-activated gadgets. Anybody with access to this unit can use it to execute tasks, inquire about accounts and services connected to it, and ask it questions [48].

By adopting the various technologies, different tasks in agriculture domain can be provided the solution in more efficient way:

• For agricultural purposes, the information about field conditions, including air and soil temperature, weather forecast,

soil moisture, price forecasting, disease detection capabilities, and other pertinent variables, be quickly and easily accessible. Virtual assistants can be created for this purpose.

• Young farmers who require advice on crop diseases either wait for an agriculture professional to be online or use search engines to find the information. Farmers are compelled to wait until the experts respond to their questions because there aren't enough agriculture professionals. An automated answering method is needed to overcome this problem. The Indian farmers face huge difficulty in choosing the right crop according to the specific region and climatic conditions.The machine learning algorithms can be employed for providing solution to this

• Using a picture as input would aid in delivering additional details and provide a rapid and accurate solution.

• Audio is the most common form of communication that hardly requires any education or learning. Audio input is best and is the only one that low literate users can use. While interacting with the agent, the farmers should think as if they are talking to real person. Conversational systems provide immediate information without any need to follow complicated steps as frequently required by graphic user interfaces (GUI)[17].

• The phone-based agricultural extension system /an Interactive Voice Response (IVR) system helps the farmer to get agricultural advice messages, but is not truly interactive.

VII. CONCLUSION

Farmers find it challenging to get the precise information online in the needed time inspite of modern technology and a vast number of data. There are many different chatbots and question-answering programmes, but very few of them offer accurate and useful information. Giving a precise response for the virtual assistant system is difficult. A well-developed system must be able to retrieve user queries in the form of natural language, classify user inquiries using an effective classifier and provide the accurate response. While designing the virtual assistants for this application, a due thought should be given that Low literarcy and limited digital illiteracy of the users has to be duly handled to make the application run successful, generating trustworthy

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responses from authentic information is other major issue which needs to be addressed. Image and audio-based queries and generating audio responses will be more useful method.

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