

Radical Evolution 4.0 Agile Agriculture SPIS & Awareness using NLP with Emerging Hi-Tech

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Abstract

India must integrate two vital national objectives – food security and solar mission and its related awareness is the subpart of national aims. Using proper solar power, will helps the farmers to boost land fertility and its effectiveness. Because India is primarily an agro-based economy, co-locating solar with agriculture makes a lot of sense. It additionally permits India to link the government's aim of achieving 175 GW by 2022 with different farmer-centric targets like the multiplication of farmer financial rewards. High-yield agriculture will be developed between 2021 and 2025 and will try to advance and scale the development of the agricultural field with the internet of things, machine learning, and blockchain. Timely access to mandatory data and innovative service transformation is the key to profitability. The automatic watering system improves growing conditions, saves time and water, and is particularly useful in drought-prone areas. In the industrial sector, the production and consumption of agricultural commodities, plants, crops, and other basic needs are geographically diverse. A country's trading system is stimulated by agricultural production. This research paper aims to propose an application using emerging technologies and try to solve some basic challenges in their life.

Keywords- Indian Farmer, Mobile DAPP, Content, Embedded System, ETH Faucet.

1. Introduction

The Internet of Things involves multiple modifications, industrial movements, technological development, environmental design, and a practical and generous framework that includes everything. The IoT has the potential of approaching endless. Innovation form a dissimilarity in us occupied faster, living the era, and acquiring accepted control over our lives. The most reason for the web search out supply certain-period knowledge.[13] This research paper discussed machine learning, artificial intelligence, and its applications in agriculture, healthcare management, and social studies. Agriculturists can create the correct choice and established actual-opportunity knowledge among all phases of crops and time. Crops are the foremost crucial component in cultivation. Seeds of

plants are familiar with enormous-scale developments for nutrition production. Agriculture requires large quantities of water for irrigation and of good quality for the various production process. studied about rural development sub ah farms of Saharan region of Africa. It studied drip-driven irrigation systems for rural development of Sub-Saharan Africa.[51]. India is a global agricultural powerhouse. One of the most critical demands for agricultural growth is a comprehensive overhaul and consolidation of India's agricultural research and extension sector. Agriculture is India's Water and farmland are irrigated, resulting in the development of rural livelihoods. Through two national programs established in India over time, R&D in the field of agricultural technology has been conducted.

Food crops predominate[33] This paper gives the information about the supply chain and its benefits and its different kind of distribution processing, and farming products and it starts their journey from soil to the market Food crop cultivation, is a top focus for farmers, is found practically everywhere in the country. Agriculture in India has several challenges. 1. Long-standing problems and the merging issues from the preventing agricultural practices, system changing and 2. climate and economy. Different types of modern methods are available in the market and other countries for the farmer's development but due to less awareness the farmers do not apply in their sector [40] This research paper described a new and advanced way of RS using BC. It used a decentralized matrix completion form for collaborative filtering and a trust-based recommendation system. Awareness plays a very vital role in society as well as in the farming sector also. Any informative awareness related to the farming sector it helps to farmers to understand things from

multiple standpoints.[41] This research topic was discussed by 13 faculty researchers and experts. It described about IoT, smart contracts, and transaction records are very important for the agriculture fields. The data was collected through a questionnaire about the supply chain is very highly active in the agriculture sector. It described about IoT, smart contracts, and transaction records are very important for the agriculture fields. The data was collected through a questionnaire about the supply chain is very highly active in the agriculture sector. On social media platforms, misguiding people with worthless information is very common but it's too much harmful, etc. The aim of this research paper is proper supply of water to the crops using Wi-Fi communication and provide proper information related to the farming sector it helps them to adapt and connect to the new world of farming article provided them without any third-party access. They can use and access all data using mobile applications.

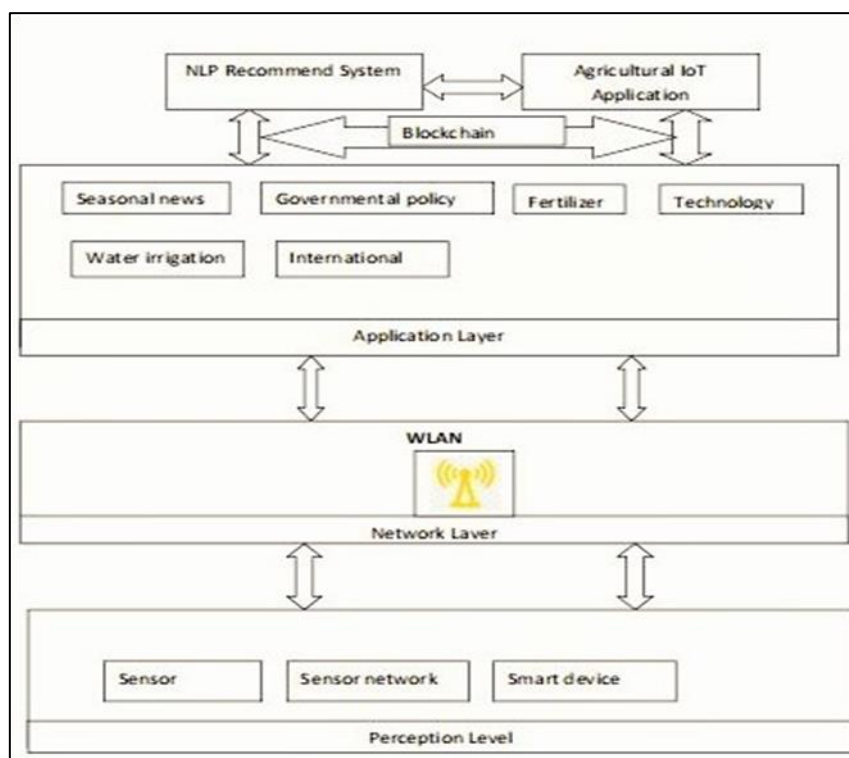


Fig1: Proposed System Architecture

This proposed system architecture has a 3 layer architecture. Each layer has its meaning and features which are connected. The first perception layer connects with multiple devices for the collection of information from the sensors and smart devices. The second layer is a network layer, it communicates with other networks for performing an assigned task by the user. The third layer interacts with each other. The NLP -based recommendation system and IoT application connect with the third layer the application layer. It interconnects with BC for security and transparency purposes.

2. Methods and Material

This research paper, highlight the farmer's daily issues and for solving purpose,

proposed an agriculture mobile application that is specially designed for farmers. In this proposed application there are 2 features 1. Automate SPI system 2. News recommendation system

1. **Automate SPI system-** Through these applications, the farmers monitor the water level of the plantation very effectively. In this proposed system set the value of moisture level for the plant at 60 or 40 as per the farmer's decision, the farmer has the authority to set the moisture level through node MCU wireless fidelity. This field communication occurs after the farmer set the value of the water level of the pump. Through this wireless network, the communication is established between the 2 modules as follows.

Table 1. Wi-Fi based field communications between two modules

| Server Module | Led signals & its meaning | Client Module |
|---|--------------------------------------|----------------------------|
| Searching for Node MCU wireless fidelity pairing. | Blue Led blinking. | Pairing. |
| Communication Established | Blue Led glow. | Communication established. |
| Power on | Green Led glow. | Power on. |
| | | |
| When the following conditions is occur in the field that time this communication messages send between two modules during operation are as follows | | |
| Condition 1 | | Message 1 |
| The soil moisture sensor is not jab into the field. | Red Led glow. | Device is not jab. |
| Condition 2 | | Message 2 |
| The soil moisture sensor jab into the soil. | Off the red led light. | Soil is in good condition. |
| Condition 3 | | Message 3 |

| | | |
|------------------|---|-------------------|
| The soil is dry. | Light green led glow Automated SPI system is activated. | Soil needs water. |
|------------------|---|-------------------|

Table 2. Materials of two modules with its using purpose.

| Sr. no | Material used in automated SPI system | | Purpose of using in proposed system |
|--------|---------------------------------------|-----------------------|---|
| | Server | Client | |
| 1 | Solar chargers module | Solar chargers module | It is used to store the photovoltaic energy. After the sunset it is use-able. |
| 2 | Solar panels 5Watt | Solar panels 5Watt | It helps to reduce the GHG in the environment, reduce the problem of electric shortage, Save money |
| 3 | NodeMcuESP8266 | NodeMcuESP8266 | It connect object easily it transfer the data using protocol |
| 4 | Batteries 2000mAH | Batteries 2000mAH | It is a rechargeable battery Its 3.7V .It is lithium ion polymer. It is useful for application. |
| 5 | Soil moisture sensor | | It measures the estimate amount of water at location in the field. It helps to proper irrigate the plants .When the plant need water. |

The 2nd proposed system is the news recommendation system using ML, secured by the smart contract.

The 3rd proposed system is a design of an agriculture app. By using this mobile application the smart contract provides security to the complete operations. This emerging proposed system workflow is as follows.

This recommendation system provides 2recommend news related to the 6 kinds of news which are all related to the farming sector for the security purpose it connects with smart contracts.

Step1: The admin panel has the authority to view and insert the news.

Step2: Then it transfers the news to the central server for storage purposes. If any new news is added by the admin panel.

Step3: Central server responds to the admin panel updating news and existing news stored successfully.

Step 4: Admin panel call the ml model to read the updated data, then the ML model check for any updated news from admin to CS. If it is yes then it will work and process on it.

Step 5: The CS sends the updated data to the ML model to process it

Step 6: ML sends the process data to the CS. Here, the central server store the raw news datasets input and processed data input.

Step7: Agriculture app sends the request for any updates to the central server.

Step 8: Central server sends updated news to the agriculture app which is added for the recommendation. This process will

happen when any news is updated by the admin otherwise it is always stable. Finally stored and deploy the news on the testing

network of eth faucet. It will protect from any third-party access.

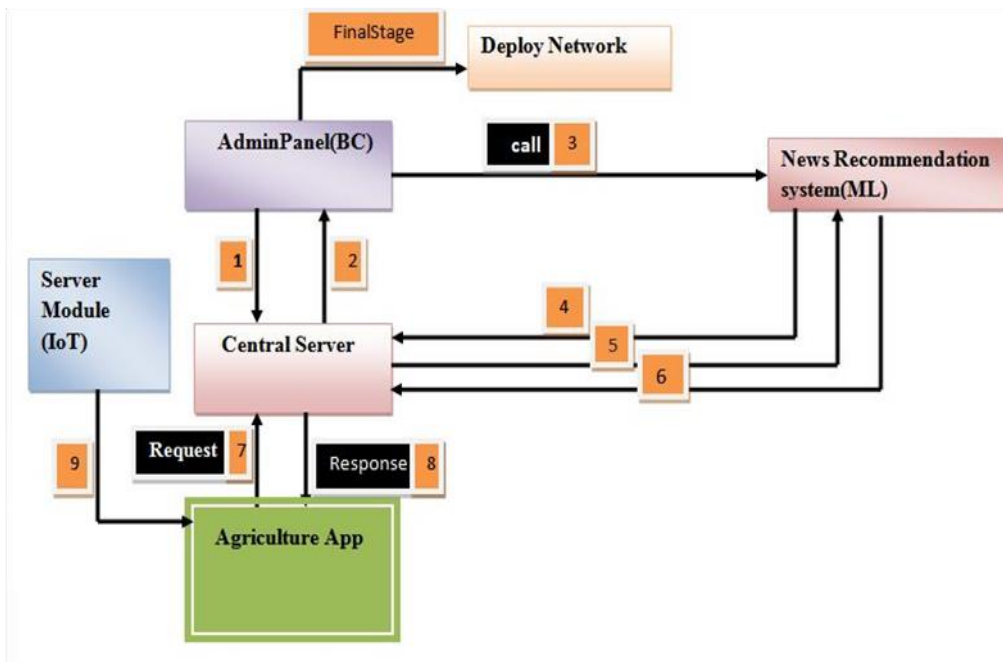


Fig2. Workflow of Emerging Proposed System.

3. Theory

There are multiples problem that occurs in the Indian agricultural sector are as follows,

1. Shortage of good qualities of seeds.
2. Shortage of modern equipment and machinery .
3. Less amount of fragmented landholding.
- 4 Facilities Shortage.
5. Unsatisfactory irrigation facility.

The main purpose of the internet of things in the agriculture sector is when the devices or things connect for communication without human intervention the job is done Here in this proposed system when the farmer's equipment connects without human

intervention and performs its job without manpower it quietly effective things for any farmers. The importance of an irrigation system is because of insufficient rainfall and, crops need water at every stage of growth for enhancing their productivity and yielding. [52] The researcher proposed that a cuckoo search algorithm has been developed although they do not take into account the characteristics of climate and they are used the thing-speak to display the sensing data which is collected by sensor hardware. In our proposed system first farmers acquire data from the sensor and perform an action through communication and it happens without human intervention when it connects with renewable energy, it provides more Wi-Fi communication between two modules based on this power. This system saves energy, reduces GHG, saves water supply management, saves extra money on manpower, and reduces.

```

server
#include <ESP8266WiFi.h>
#include "ESPAsyncWebServer.h"

#include <Wire.h>
#include <EEPROM.h>
// #include <Adafruit_Sensor.h>
// #include <Adafruit_BME280.h>

// Set your access point network credentials
const char* ssid = "NodeMcu";
const char* password = "123456789";
//double sm;

// Create AsyncWebServer object on port 80
AsyncWebServer server(80);
const char* PARAM_MESSAGE = "message";
String helloWorld(){
  return String("Hello World");
}
String readPres() {
  // int datal= analogRead(A0);
  // String data2=String(datal);
  String sm;

```

Fig3.1. Embedded coding of Server module

```

client (Arduino 1.8.19)
File Edit Sketch Tools Help
client
#include <ESP8266WiFi.h>
#include <ESP8266HTTPClient.h>
#include <WiFiClient.h>

#include <ESP8266WiFiMulti.h>
ESP8266WiFiMulti WiFiMulti;
const char* ssid = "NodeMcu";
const char* password = "123456789";
//Your IP address or domain name with URL path
const char* serverNameHello = "http://192.168.4.1/";
#include <Wire.h>
#define SCREEN_WIDTH 128 // OLED display width, in pixels
#define SCREEN_HEIGHT 64 // OLED display height, in pixels

// Declaration for an SSD1306 display connected to I2C (SDA, SCL pins)
#define OLED_RESET -1 // Reset pin # (or -1 if sharing Arduino reset pin)
//Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, OLED_RESET);
String hello;
unsigned long previousMillis = 0;
const long interval = 5000;
void setup() {
  pinMode(LED_BUILTIN, OUTPUT);
  pinMode(D3, OUTPUT);

```

Fig3.2. Embedded coding of client module

A hybrid model is proposed that for the recommendation. It is based on Chi-square selection and soft-max regression. It uses tf-idf training datasets. they achieve the accuracy in their proposed system is 37%.[34] In our system used the unsupervised machine learning type with the concept of NLP. The main concept of NLP is to break down the words using the RAKE algorithm and find the similarity score of news using cosine similarity. In this content-based recommendation

system, farmers see them as per their choice and from all the set of news. As per his choice, the next 2 recommended based on news shows as per their article finding process. In the news recommendation purposed system, some important terms are used for performing during recommendation it is used are as follows

1. **NLTK** - It stands for natural language toolkit, imported from the python package. It analyzes the unstructured data.

2. **NLP** - It is a natural language processing. It is a powerful tool for prep process text data.

3.**RAKE**-Keyword extraction algorithm-It is a rapid automatic keyword extraction algorithm in NLP It includes in NLTK

4. **Cosine Similarity**-It is a method of normalizing document length during comparison. Text matching vector A and vector B.

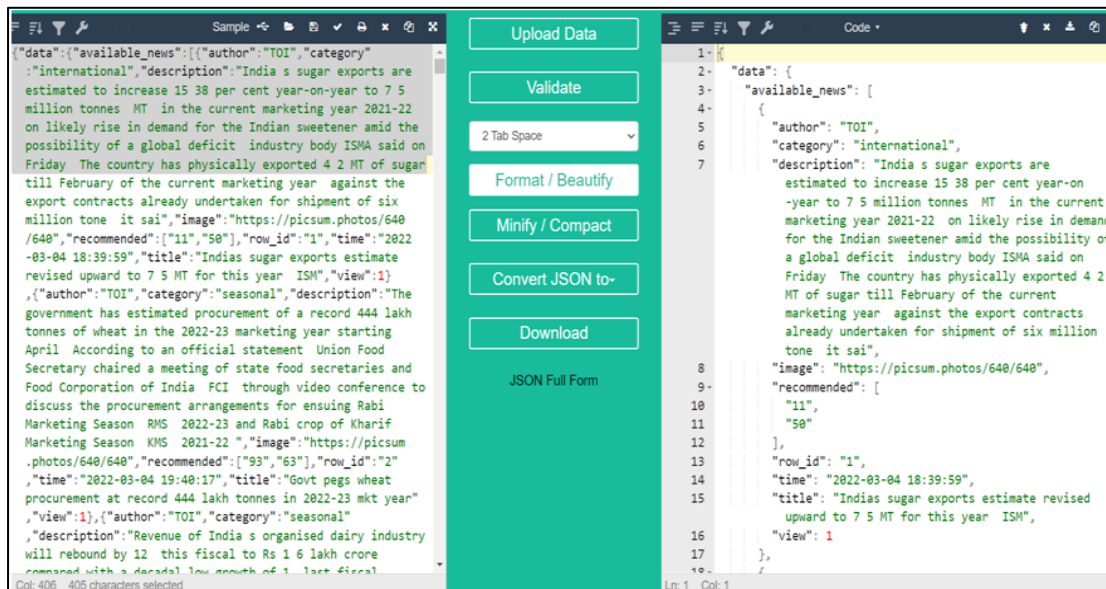


Fig 3.3.Code of NLP

Smart contract important term used for providing security This proposes mobile application is 20% DAPP. Making this DAPP application requires some BC important concepts are used as

1. **Meta Mask wallet**-It is also called HOT wallet. It works on safety and security. It suggests users open just one tab at a time when it is inactive. Wallet ID locked.

2. **Test network Faucet**- It is an ETH faucet developer tool to get ETH. It is helpful to prevent malicious users.

3. **ABI** - It uses as a standard way to interact with smart contracts. It is JSON data that EVM recognizes to know about the smart contract.



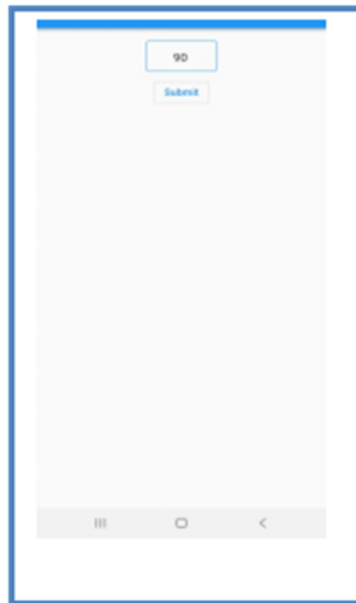
Fig3.4. Meta Mask wallet permission page.

4. Result

A DApp based mobile application is specially designed for farmers. The main aim is to solve some issues related to the agriculture sector. Using this application, we try to solve their two major problems irrigation-based and awakening awareness-

based. This research paper proposed an agriculture app for farmers.

Result 4.1 presents the set the soil moisture level of the water pump. Accordingly, automatically water flows toward the crops in the field.



Result Fig 4.1. Setting of Water level

Result 2 Shows that this proposed recommendation system provides multiple numbers of news available. As per the

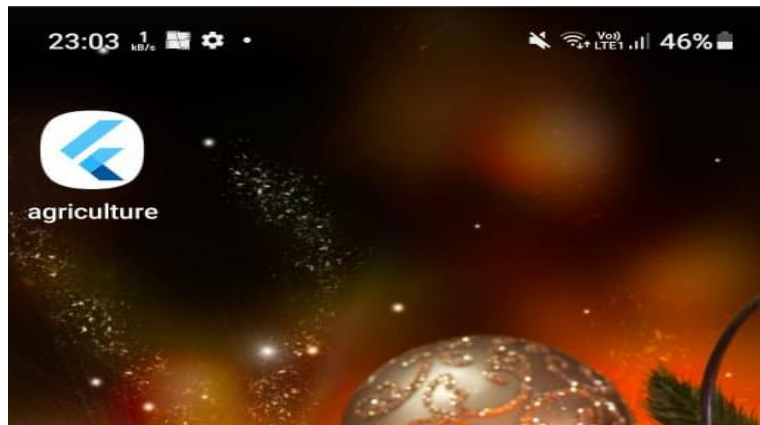
reading of the news article, that system recommends the two new related to this article.



Result Fig 4.2. News Recommendation system

Result3. Presented the whole operation done by an agriculture app. It is 20%

DApp. It is a mobile application specially designed for Indian farmers.



Result Fig 4.3. Agriculture App

5. Discussion

The agriculture sector is the most common but very an important topic for research. Multiple researchers did the research in this field but still, but it is challenging. In this research, we found that this is a part of the 4.0 revolution because it has more challenges in this field. During the survey and discuss with multiple farmers to walk with multi news technology and some are afraid about the concept of adopting new in the survey we found that they were suffered from daily basics challenges like loss of water, crop failure and many more challenges which is the most common in every field. This proposed application tries to solve some challenges based on the research questions system it is a solar-powered based automated irrigation system and it automatically operates through the device. Proper supply water management help to reduce the help in enhancing their crop productivity. For adopting the new techniques and knowledge about the globe what is going on in the globe and how we can apply the multiple trends related to the farming like Israel country. For applying a technique like Israel country, the main objective is awareness for them, it is very essential for them News recommendation plays a role in awareness among the farmers. The small datasets are used here. Now it will show 2 recommendations for news show

the farmers. In the future, when a large number of datasets are used that it will show more amounts of recommendations like Netflix, and Amazon. This paper uses the BC smart contract for providing security, and transparency and to protect articles of news from third-party access. The following questionnaire asked while the survey, these are research discussion questions are as follows. It helps a lot in the implementation of the mobile application.

DQ1: What is the need for an internet of things in the agriculture sector?

DQ2: How many hours are wasted during monitoring the crop field water irrigation?

DQ3: How many farmers in India used internet of things farming techniques like Punjab?

DQ4: Which the governmental policies are too much beneficial for you?

DQ5: How do you know about the in-market launch of new devices related to farming?

DQ6: Do you want to grow like Israel and solve your sector problems using multiple technologies? Etc.

6. Conclusion

In revolution 4.0, we presented emerging technological benefits related to the farming sector for the farmers When the adoption of the technology in this field, it will provide more benefits to the farmers.

In the future, many more features added in it to this app application like weather monitoring, fertilizer quantity checking, cattle health, crop growth health, etc which is beneficial to the environment as well as for farmers to save natural resources and enhance more. The awareness about the latest technologies and methods for obtaining more accuracy needs more amount data in the future it shows multiple news recommendations it is helpful to them in applying new methods in their fields. Emerging technological advancement will provide a new direction to the nation and provides awareness it will give a new perspective way of living.

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