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SmartHarvest API

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Abstract—

The SmartHarvest API is a cutting-edge application programming interface designed to revolutionize the landscape of modern agriculture by integrating advanced technologies into farming practices. This API serves as the backbone for a comprehensive smart farming application, providing seamless communication between various agricultural devices, sensors, and data processing modules.

Key Features:

Sensor Integration: SmartHarvest API seamlessly integrates with a variety of sensors, such as weather stations, soil moisture sensors, and crop health monitors, enabling real-time data acquisition from the farm.

Data Standardization: The API employs robust data standardization techniques to ensure that information from diverse sources is harmonized, providing a unified and coherent dataset for analysis and decision-making.

Predictive Analytics: Leveraging machine learning algorithms, the SmartHarvest API analyzes historical and real-time data to generate predictive insights. This empowers farmers to make informed decisions regarding crop management, resource allocation, and harvest planning.

Automation and Control: Through the API, users can remotely control and automate various farming processes, including irrigation systems, fertilization, and pest control. This enhances operational efficiency and reduces manual intervention.

Scalability: SmartHarvest API is designed with scalability in mind, accommodating the diverse needs of small-scale to large-scale farming operations. It ensures flexibility for future technological advancements and farm expansions.

Third-Party Integration: The API supports integration with third-party applications and services, fostering collaboration within the agricultural ecosystem. This includes compatibility with farm management software, financial tools, and market analytics platforms.

Security and Compliance: Robust security measures are implemented to safeguard sensitive agricultural data. The API complies with industry standards and regulations, ensuring data privacy and integrity.

User-Friendly Documentation: SmartHarvest API comes with comprehensive documentation, making it easy for developers and farmers to understand its functionalities and integrate it seamlessly into their existing systems.

Applications:

Precision Farming: Optimize resource usage and maximize yields through precise monitoring and control of farming variables.

Crop Health Management: Early detection of diseases and anomalies through continuous monitoring allows for proactive measures to ensure crop health.

Resource Optimization: Efficient use of water, fertilizers, and pesticides based on real-time data analytics minimizes waste and environmental impact.

Decision Support: Data-driven insights assist farmers in making informed decisions about planting, harvesting, and overall farm management.

The SmartHarvest API represents a significant leap forward in the realm of smart farming, empowering farmers with the tools needed to navigate the complexities of modern agriculture and enhance productivity in a sustainable and intelligent manner.

Keywords— *Technology, Data, Web, API, Smart Farming*

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I. INTRODUCTION

In

the ever-evolving landscape of agriculture, the convergence of technology and farming practices has given rise to a new era of efficiency and precision. The SmartHarvest API stands at the forefront of this transformation, ushering in a paradigm shift in how we cultivate and manage our crops. This API represents a pivotal tool for modern farmers, integrating cutting-edge technologies to optimize every facet of the farming lifecycle.

1. The Vision of Smart Farming:

SmartHarvest API is born out of the vision to create a smarter, more sustainable future for agriculture. By harnessing the power of data, automation, and connectivity, our API seeks to empower farmers with actionable insights, enabling them to make informed decisions that drive productivity, conserve resources, and enhance overall crop yield.

2. Seamless Connectivity:

At its core, SmartHarvest API is a bridge that connects the diverse components of a modern farm. It seamlessly integrates with a myriad of sensors, devices, and data sources spread across the agricultural landscape. From soil health monitors and weather stations to crop sensors and machinery, the API orchestrates a symphony of data to provide a comprehensive view of the farm's ecosystem.

3. Data-Driven Decision Making:

The heart of SmartHarvest API lies in its ability to turn data into actionable intelligence. By collecting, standardizing, and analyzing real-time and historical data, the API empowers farmers with predictive analytics. This data-driven approach facilitates precise decision-making, from optimal planting times to resource allocation, all aimed at maximizing yields and minimizing environmental impact.

4. Precision Automation:

Automation is a key pillar of SmartHarvest API. Farmers can remotely control and automate critical processes such as irrigation, fertilization, and pest control. This not only enhances operational efficiency but also allows for a more hands-on and proactive approach to farm management.

5. Collaborative Ecosystem:

SmartHarvest API is designed with openness in mind. It seamlessly integrates with third-party applications, encouraging collaboration within the broader agricultural ecosystem. This includes compatibility with farm management software, financial tools, and market analytics platforms, fostering a connected and dynamic environment.

6. Security and Compliance:

Recognizing the sensitivity of agricultural data, SmartHarvest API prioritizes security and compliance. Robust measures are in place to safeguard data integrity and privacy, ensuring that farmers can trust the system with their most critical information.

In essence, SmartHarvest API is more than just a tool; it's a catalyst for agricultural evolution. By providing farmers with the means to harness technology intelligently, we aim to cultivate a future where agriculture is not only more productive but also sustainable, resilient, and attuned to the demands of our changing world. Welcome to the future of farming with SmartHarvest API – where intelligence meets agriculture.

II. LITERATURE REVIEW

A. Scientific Study

The following describes several related studies regarding the API web service:

a) Nina, Rachman, & Surahman (2020), Artificial Intelligence-Based Agricultural Information System (E-Tandur). In this study, an agricultural information system based on the Internet of Things (IoT) is used as a medium to increase the precision of the quality of agricultural products. By integrating information systems into the agricultural sector, it will increase the quality, resilience and make the cost of agricultural production effective.

b) Saputri & Mulyono (2019), Analysis and Design of a Management Information System for Web-Based Harvest Data Reporting at the Jambi Province Food Crops Agriculture Service. The information system built supports the process of recording, processing, searching for data to the process of presenting reports. So, the information system built will be very supportive in presenting information that supports decision making.

c) Rahayu, Cahyana, & Cahyana (2019), Designing a Web-Based Agricultural Product Information System with a Unified Approach. This information system is designed to make it easier for farmers to inform agricultural products directly to consumers.

d) Aprini (2019), Designing a Web-Based Agricultural Product Marketing Information System in Pagar Alam City. In this study, namely designing an information system that can be used to promote, inform quickly, precisely and accurately the agricultural products in Pagar Alam City. So that the agricultural products of Pagar Alam City can be recognized by people outside the city of Pagar Alam or the wider community, so that they can attract consumers to make purchases.

e) Elmayati & Hazilawati (2019), Design of an SMS Gateway-Based Information System for Agricultural Product Extension in Musi Rawas District. By utilizing the SMS Gateway technology, farmers in the Musi Rawas district will find it easier to obtain

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information about agricultural crop cultivation procedures, agricultural commodity prices and agricultural issues. In addition, the implementation of agricultural extension activities will be easier and ableto reach remote areas.

f) Perkasa & Setiawan (2018), Community Data Web Service Development Using REST API with Access Token. In this study, the application built provides a web service data for the community to create and register job seeker cards using data from the Population and Civil Registry Service. This application is able to provide and facilitate many parties, such as data administrators to monitor data usage, employee registration in data input, and people can register independently.

g) Setiawan, Eosina, Primasari, & Ridwan (2018), Information System for Medicinal Plants Management (SITANO). In this study, the information system was made web-based to facilitate the management of medicinal plants. The informationsystem built contains a lot of information starting from nursery activities, plant care, to administrative and financial reports. Making the medicinal plant information system turns out to make the management of medicinal plants more effective and efficient.

h) Wulandari, Ugiarto, & Hairah, (2017), Information System for Herbal Medicines. This information system contains information about herbal medicinal plants, the substances contained in these plants, properties and methods of processing these plants so that they can be used to become herbal medicinal plants. The information system that was built aims to facilitate the public in searching for information on herbal medicine.

i) Sundari (2016), Web-Based Information System for Community Health Center Services. This patient service information system is designed to improve manual systems that are slow so that services become ineffective and efficient, so that a computerized information system is built, making it easier for the Public Health Center to process patient data and patient medical records into reports.

j) (Prasetyo, Fauzi, Supratman, & Murti, 2016), Web-Based E-Farming Information System Design System to Determine the Feasibility Level of Harvest in the Agricultural Sector. This information system is designed to be able to provide an early detection statement of the occurrence of a level of feasibility or inappropriate yields in the agricultural sector.

B. WEB

Definition of the website according to the Cambridge dictionary (Cambridge Dictionary , n.d.): a set of pages of information on the internet about a specific subject, whichhave been published by the same person, company, or organization, and often contain images, videos, and sounds.

A website is a collection of interrelated, publicly accessible Web pages that share a single domain name. Websites can be created and maintained by individuals, groups, businesses or organizations to serve various purposes. Together, all publicly accessible websites constitute the World Wide Web (Technopedia, n.d.).

Website is a web page that is interconnected which generally contains a collection of information in the form of text data, images, animation, audio, video or a combination of all that is usually made for personal, organization and company (Indowebsite, n.d.). Picture 1 shows the information and features contained in the website.

Picture 1 Website information and features(acodez.in)

C. API (Application Programming Interface)

API stands for Application Programming Interface, and allows developers to integrate two parts of an application or with different applications simultaneously. API consists of various elements such as functions, protocols, and other tools that allow developers to create applications. The purpose of using the API is to speed up the development process by providing separate functions so that developers don't have to build similar features. Implementation of the API will be very felt if the desired feature is very complex,of course it takes time to create something similar to it. For example: integration with a payment gateway. There are various types of system APIs that can be used, including operating systems, libraries, and the web. Web API is accessed via the HTTP protocol, this is a concept not a technology. We can create a Web API using different technologies such as PHP, Java, .NET, etc. For example, the Rest API from Twitter provides read and write access to data by integrating Twitter into our own

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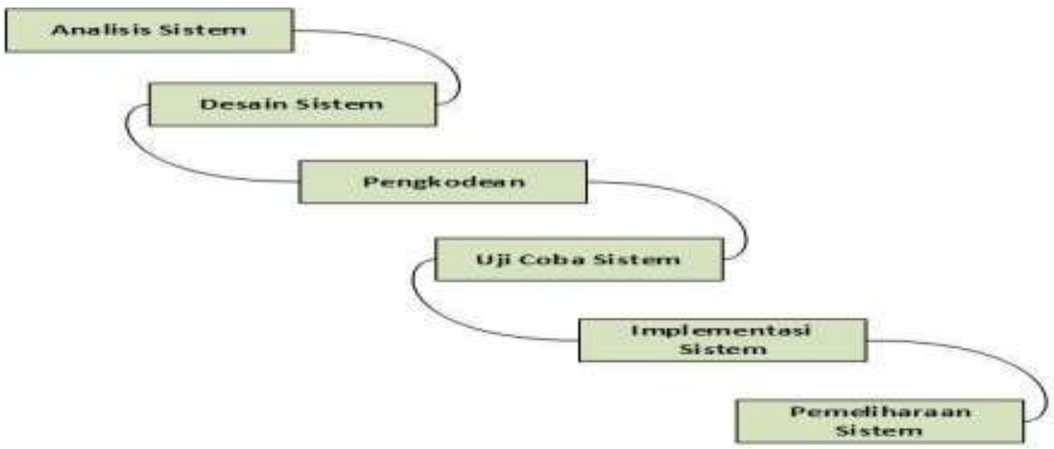
application (Sandi, 2017).

Picture 2 API Scheme(codepolitan.com)

Web Service is software that is created to bridge machine to machine in a network or a service that allows interaction and communication between different systems (interoperability) in a network. Web services store data with an XML standard so that this results in the sharing of communication between different operating systems, compilers, and platforms. And in the process, web services do not need a GUI because web services work in logical functions and request data. So basically Web Service is a method that bridges between 2 machines or 2 different systems to be able to communicate on a network while API is a collection of libraries or functions in making software to be able to communicate between 2 different software (Arni, 2018).

III.REASEARH METHODS

The methodology to be used in this research is by using the Waterfall method which is part of the Software Development Life Cycle (SDLC) model. The stages of this model start from the system analysis stage, system design and so on to the system maintenance stage. The cycle of the waterfall model can be seen in Picture 3.



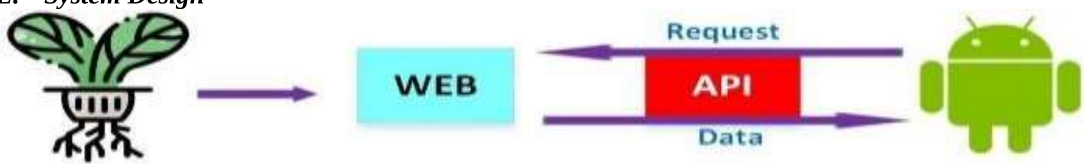
Picture 3 Schematic of the Waterfall model

D. System Analysis

At the system analysis stage, an analysis of the problemsand systems to be built is carried out. Analysis is needed to determine system requirements, starting from the form of data to be processed by the system to analyzing system requirements in building APIs so that they can become data bridges for various devices.

E. System Design

At this stage, the system planning is carried out according to the system requirements that have been determined at the system analysis stage. The system to be built is the web and API. The web will receive data from hydroponic plants, while the data received will be displayed on the web and stored in the database as data that will be given to android devices through the help of an API. The flow of the system is as shown in Picture 4.



Picture 4 System Flow

F. Program Coding

At the coding stage, namely creating a web and API using a programming language based on the system design that has been made.

G. System Trial

At the system trial stage, an experiment is carried out whether the web created can receive, store and display data received from hydroponic plants properly. In addition, testing is also carried out whether the API created can provide data to Android devices according to the request.

H. System Implementation

The implementation stage is the stage for implementing a system that is made ready for use. The system is implemented according to plan, namely receiving data from hydroponic gardens and displaying it on the web and storing it in a database server. The system also provides data to the android device according to the data request from the android device.

I. System Maintenance

System maintenance is necessary to ensure that the system continues to run properly. At the system maintenance stage, it is necessary to pay attention to the data received, stored, displayed and given accordingly.

IV. RESULTS AND DISCUSSIONS

Here are tenants or registered users using the API feature to collect data from hydroponics as shown in Picture 5.

Picture 5 User

Registered users have four types of data, namely data ontemperature, humidity, pH and water nutrition. The following Picture 6 is a web view of the environmental temperature of hydroponic plants

Picture 6 Temperature

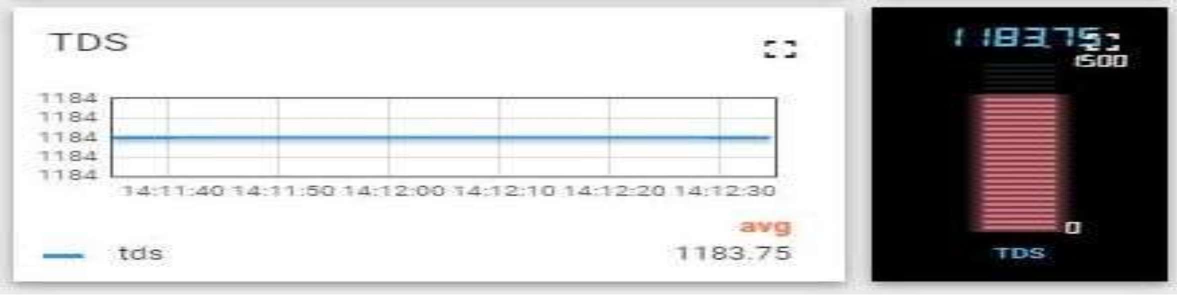
The following Picture 7 is a web view of humidity fromthe hydroponic plant environment.

Picture 7 Humidity

The following Picture 8 is a web view of the pH of the hydroponic plant environment.

Picture 8 pH

The following Picture 9 is a web view of the pH of the hydroponic plant environment.



Picture 9. TDS

Of the four types of data received, namely temperature, humidity, pH and water nutrition, they can be displayed properly on the website. In addition, systems with API features can also provide data to Android devices as shown in Picture 10.

Picture 10 Display Data on Android Devices

V. CONCLUSION

In conclusion, the SmartHarvest API emerges as a transformative force in modern agriculture, embodying the convergence of technology and farming practices. This pioneering API, designed to optimize and elevate every facet of the farming lifecycle, has the potential to redefine the landscape of global agriculture.

From the results of the discussion carried out in the research "Designing Web and API (Application Programming Interface) Smart Farming Applications" it can be concluded that the web and API in the smart farming application can receive, store and display hydroponic plant data and provide that data on an android device. . This achievement will facilitate monitoring of hydroponic plants as part of a smart farming system.

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